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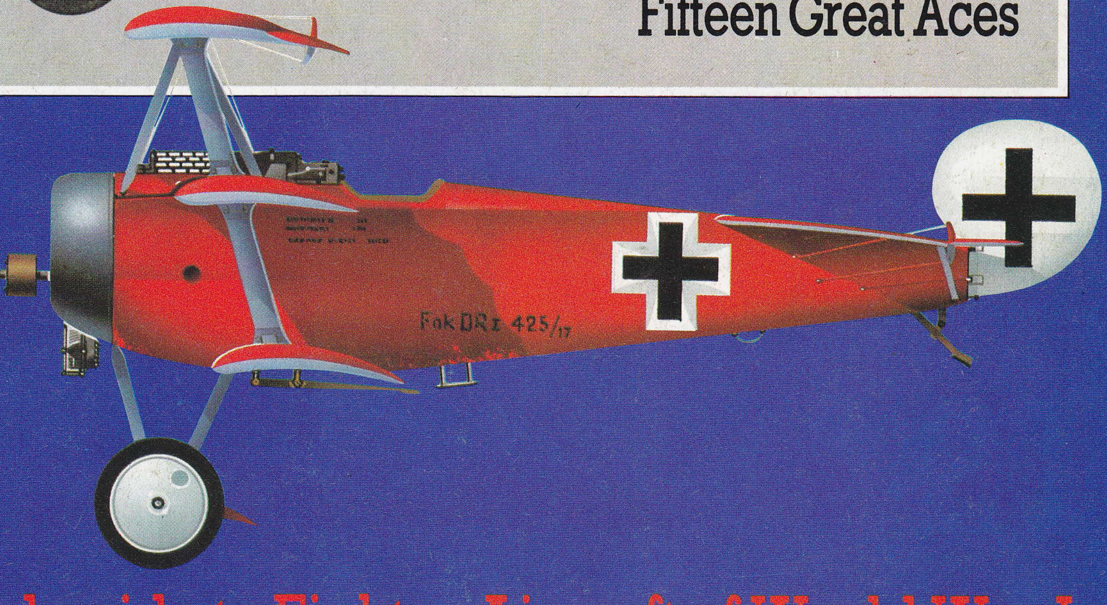
The Great Fighter Aces of the War

Fifteen Great Aces



Sopwith Camel in Action

Evolution of the Dogfight

A fully illustrated guide to Fighter Aircraft of World War I

WAR MACHINE

Volume 2 **Issue 20**

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Picture acknowledgements
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Published by
Orbis Publishing Ltd
© Aerospace Publishing Ltd 1984
Colour profiles, diagrams and
cutaway drawings © Pilot Press Ltd

Editorial Offices
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London W4 4PH

Managing Editor: Stan Morse
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Colour Origination: Imago Publishing Ltd, Thame, Oxon
Typesetting: SX Composing Ltd
Film work: Precise Litho Ltd

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Keith Fretwell
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19841

Printed in Great Britain by The Artisan Press Ltd

Distribution and marketing offices:
Orbis Publishing Ltd
Orbis House
20-22 Bedfordbury
London WC2N 4BT
Telephone: 01-379 6711
Circulation Director: David Breed
Marketing Director: Michael Joyce

WAR MACHINE
Price UK 80p. IR £1. Aus $1.95. NZ $2.25. SA R1.95. Singapore $4.50. USA and Canada $1.95

How to obtain your copies of WAR MACHINE: Copies are obtainable by placing a regular order at your Newsagent, or by taking out a subscription.

Subscription Rates
For six months (26 issues) £23.80; for one year (52 issues) £47.60. Send your order and remittance to Punch Subscription Services, Watling Street, Bletchley, Milton Keynes, Bucks MK2 2BW, being sure to state the number of the first issue required.

Back Numbers
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Australia: Back numbers are obtainable from WAR MACHINE Back Numbers, Gordon & Gotch (Aus) Ltd, 114 William Street, PO Box 767G, Melbourne, Vic 3001.
South Africa, Europe, Malta and New Zealand: Back numbers are available at cover price from your Newsagent. In case of difficulty write to the address in your country given for binders. South African readers should add sales tax.

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Europe: Write with remittance of £5.00 per binder (incl p & p) payable to Orbis Publishing Ltd to WAR MACHINE Binders, Orbis House, 20-22 Bedfordbury, London WC2N 4BT.
Malta: Binders are obtainable through your local Newsagent, price £3.95. In case of difficulty write to WAR MACHINE Binders, Miller (Malta) Ltd, M.A. Vassalli Street, Valletta, Malta.
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The WAR MACHINE published by Orbis Publishing Ltd has no connection with the WAR MACHINE published by Emjay. The latter is a magazine devoted to computer simulation gaming and further information and subscription details can be obtained from Emjay, 17 Langbank Avenue, Rise Park, Nottingham NG5 5BU, England.

WAR MACHINE

Forthcoming issues feature: Carrierborne Aircraft
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Modern Automatic Weapons
Fighter-bombers of World War I
Modern Aircraft Carriers

Fighter Aircraft of World War 1

With the outbreak of war in 1914, few could have foreseen that the wire, wood and fabric birdcages with which daring spirits took to the air would evolve within four years into the potent and versatile fighting aeroplane.

No fighter in history was as famous as the Fokker Triplane of Richthofen, the Red Baron. Several replicas have been built of this aircraft.

The whole gamut of air combat came to be realized in the four years of World War I, originally initiated by the need to deprive the enemy of uninterrupted use of the aeroplane as a vehicle of reconnaissance. When it was realized that such aircraft could fly beyond the range of small arms fire on the ground, opposing observers began carrying personal weapons with which to defend themselves in the event that an enemy aircraft appeared in their vicinity. Such was the good use made by the Allies of their early observation aeroplanes that in 1915 the Germans started to introduce purpose-designed aircraft whose pilots were ordered to seek out and destroy the offending intruders; hence the term 'fighting scout' gained universal acceptance to describe the early generation of air combat aeroplane.

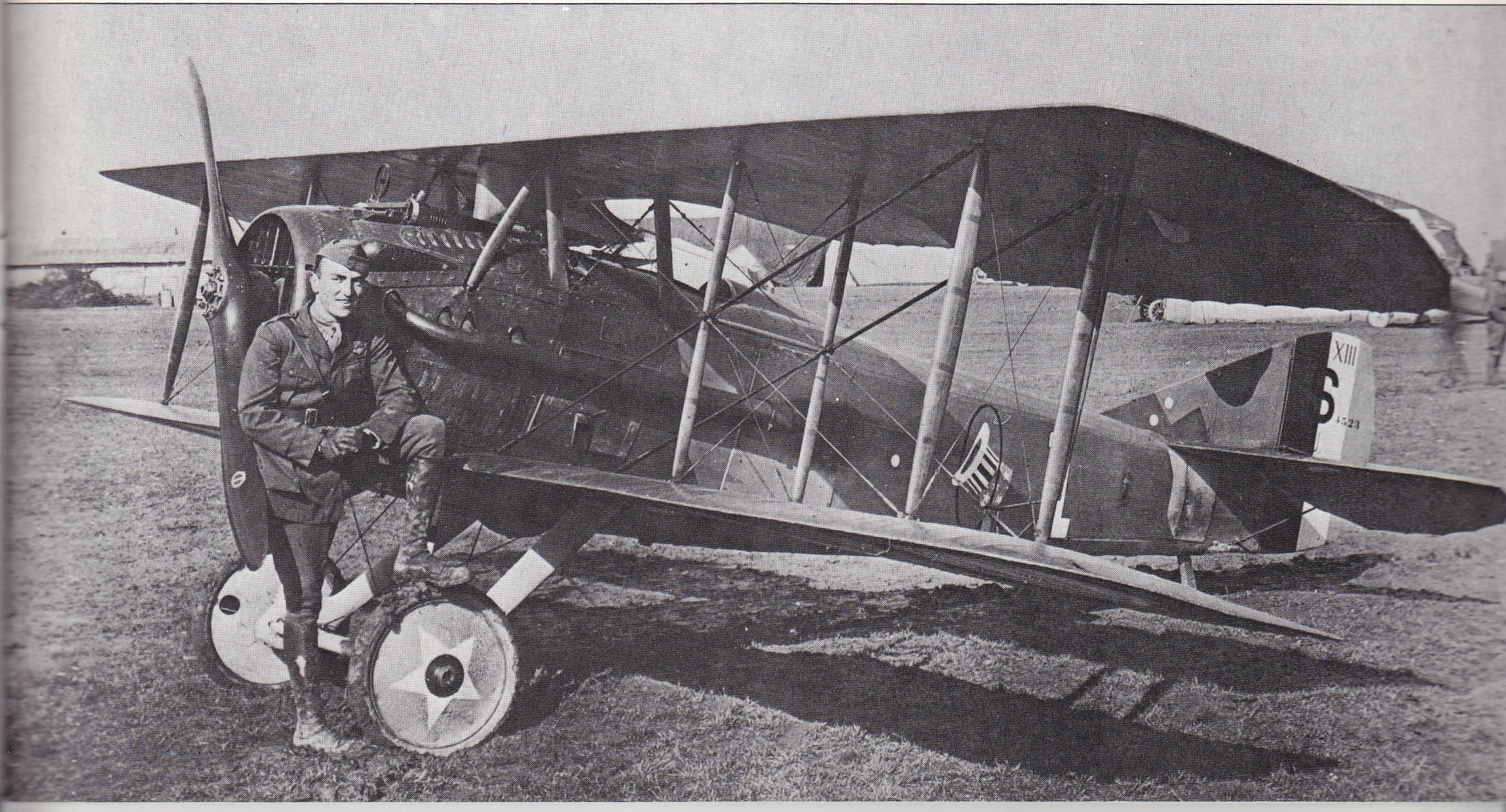
Inevitably the next stage was to provide the elderly reconnaissance biplanes (whose lack of power rendered the routine mounting of a defensive gun impractical) with an escort, and in due course (roughly half way through 1915) the first true air combats were being fought in the skies over the Western Front. The first protagonists of the new aerial warfare were the German Fokker monoplanes and the Morane monoplanes, soon to be joined by the British Airco D.H.2, but it was on account of its superior manoeuvrability and front gun that, in the hands of such pilots as Boelcke and Immelmann, the 'Fokker scourge' dominated those skies for nigh on a year.

The second half of the war brought about tremendous advances in technology as well as greatly increased expenditure on the build-up of the aircraft industries of Germany, France and the UK. Perfection of the gun interrupter gear virtually ended the era of the pusher biplane, in which the location of the powerplant behind the pilot removed the chances of the propeller being shot off, and an armament of twin forward-firing, synchronized machine-guns became recognized as standard for almost every fighting scout in service, leaving the aircraft designer free to wring the last ounce of performance from available engines in his search for domination of the dogfight.

Scouts such as the Sopwith Pup, Halberstadt D I and D II, Albatros D I and D II, Fokker D II and D III, and Nieuport XI were but a transient generation, but one in which the elements of air combat were recognized and defined. By mid-1917 all were obsolescent, and during the last year of the war men whose names have passed into the lore of the air were fighting at the controls of such classic aeroplanes as the Sopwith Camel and Triplane, Royal Aircraft Factory S.E.5a, Fokker D VII and Triplane, Pfalz D III, Siemens-Schuckert D III, Nieuport 17 and 28, and SPAD XIII.

Thereafter the term scout was discarded as misrepresenting the purpose for which the aircraft was intended, and the Bristol F.2B Fighter gave its name to the breed whose primary function had already for two years uncompromisingly dominated the skies over France.

Leading American ace of the war, Captain Eddie Rickenbacker, pictured here with his SPAD XIII which he flew with the 94th Aero Squadron in 1918; note the famous 'Hat in the Ring' insignia on the rear fuselage. The mud was a regular feature of a wartime airfield.



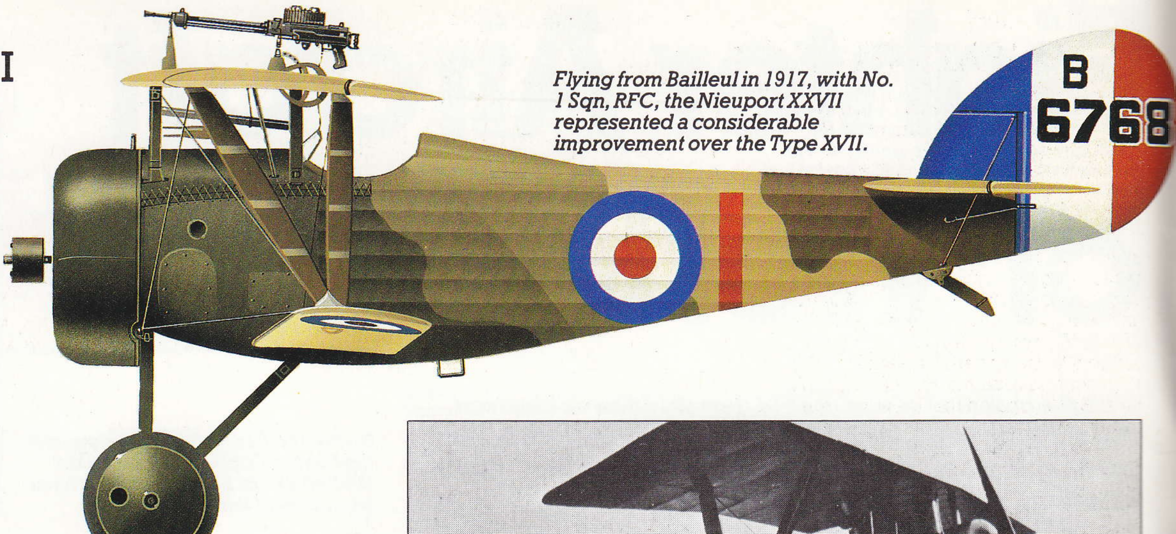
FRANCE

Nieuport XVII

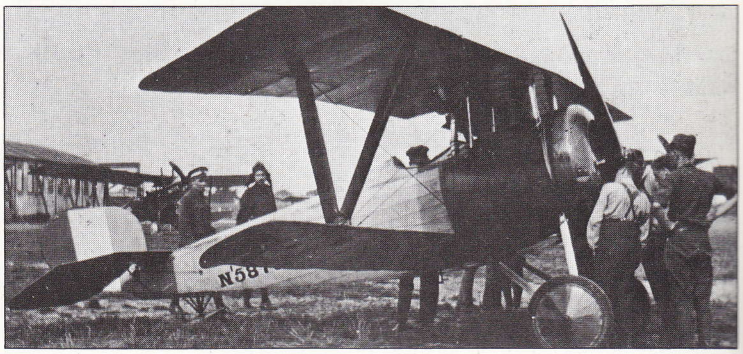
Strictly sesquiplanes (that is aircraft with 'one-and-a-half' wings), the Nieuport family of scouts dated back to pre-war months when the naval engineer Gustave Delage began development of a number of observation aircraft which found expression in the Nieuport X, which entered service in 1915, and the **Types XI** and **XII** scouts. All were found to be structurally unsound, but in the **Nieuport XVII** torsional strength in the single spar of the lower, short-chord wing was increased and, with greater power from the 113-hp (84-kW) Le Rhône rotary, the little scout was transformed, the benefits of high lift from the top wing and low drag from the bottom wing being fully exploited.

The Nieuport XVII (Type II) entered service with Escadrille N57 on 2 May 1916, at almost the same time as the D.H.2 with the RFC, spurred by the growing depredations of the 'Fokker scourge', although early versions are said to have served with both French and British units somewhat before this. And it was in the Nieuport XVII that the young Albert Ball rose from obscurity to national fame, flying with No. 11 Squadron and shooting down 44 enemy aircraft between August 1916 and May 1917; there is no doubt that Ball did more than any other single man to restore the flagging British confidence in RFC fortunes in the middle period of the war. At the time of Ball's mysterious death on 7 May 1917 another pilot, Captain William Bishop, was beginning to establish a reputation on Nieuport XVIIs with No. 60 Squadron. In the French air service Guynemer with Escadrille N3 displayed outstanding skill, countering the synchronized gun of the Fokker monoplanes with similar French-developed armament. Among other French scout pilots who flew Nieuport XVIIs to good effect were Charles Nungesser, Maurice Boyau, Armand Pinsard, René Dorme, Gabriel Guérin, Albert Deullin and Jean Navarre. The great René Fonck transferred direct from Caudron G IVs to SPADs without service in Nieuports.

Nieuports were also widely flown by Belgian *escadrilles*, André de Meulemeester, Edmunds Thieffry, Jan Olieslagers and Francis Jaquet all recording victories while serving with Escadrilles 1 and 5. Macchi-built Nieuport XVIIs were flown by the Italians during 1916-7, when men such as Francesco Baracca, Pier Piccio and Silvio Scaroni all opened their scores on the aircraft. Though largely outclassed late in 1917, Nieuport XVIIs survived to accompany the anti-Bolshevik forces in north Russia in 1918, and also served as trainers with the American Expeditionary Force in France that year.



Flying from Bailleul in 1917, with No. 1 Sqn, RFC, the Nieuport XXVII represented a considerable improvement over the Type XVII.



Albert Ball rose to fame in the Nieuport XVII to become Britain's first well-known ace. This is a Nieuport XVIIbis seen at Yateley in about 1917. They equipped nine squadrons in the RFC and RAF.

Specification

Type: single-seat fighting scout
Powerplant: one 113-hp (84-kW) Le Rhône nine-cylinder air-cooled rotary piston engine
Performance: maximum speed 172 km/h (107 mph) at 2000 m (6,560 ft); climb to 3000 m (9,845 ft) in 9.0 minutes; service ceiling 5300 m (17,390 ft); endurance 2 hours
Weights: empty 375 kg (827 lb); maximum take-off 560 kg (1,235 lb)
Dimensions: span 8.20 m (26 ft 11 in); length 5.75 m (18 ft 10½ in); height 2.33 m (7 ft 7¾ in); wing area 14.77 m^2 (158.99 sq ft)
Armament: (standard) one fixed 7.7-mm (0.303-in) Vickers machine-gun on nose, synchronized to fire through propeller disc (often replaced by one or two 7.7-mm/0.303-in Lewis machine-guns on Foster mounting on top wing to fire over propeller)

FRANCE

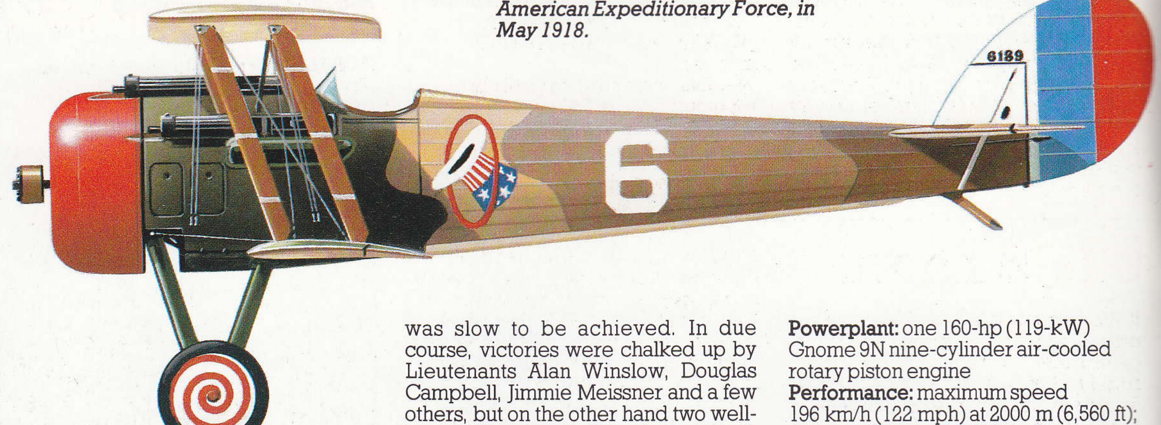
Nieuport XXVIII

The **Nieuport XXVIII** was roughly contemporary with the British Sopwith Camel and, as a direct development of the mid-war scout generation, should have achieved much greater success, continuing as it did the successful Delage sesquiplane formula. Principal design advance in the Type XXVIII lay in the improved fuselage streamlining with additional formers, revision of the vertical tail surfaces to include a fin to which the rudder was hinged in the orthodox manner, and adoption of twin, parallel interplane and centre-section struts in place of the earlier V-type. Power was initially provided by the 160-hp (119-kW) Gnome 9N rotary, though the engine seldom produced this power. However, whereas the Camel lost many of the pleasant handling characteristics of its forebears, those of the Nieuport were somewhat improved, largely as a result of the addition of the fin. Standard armament advanced from single to twin nose guns in the Type XXVIII.

General dissatisfaction with the Gnome engine led to the Le Rhône being adopted as well, and later the Gnome Monosoupape (single-valve) rotary, all engines being equipped with blip-switches which enabled the pilot to cut power momentarily during the glide, although limited throttling was also provided.

The Type XXVIII served with a few French units towards the end of 1917 but was not generally well received, the aircraft being found to shed fabric from its top wing in any energetic manoeuvre and when flown flat out. It was, however, the only aircraft available in any numbers when the American Expeditionary Force started arriving in France early in 1918 (without any scouts of its own). The first American squadrons to reach the front, the 27th, 94th 95th and 147th Aero Squadrons of the First Pursuit Group, were all equipped with Type XXVIIIs, but because of a low standard of gunnery, success was slow to be achieved. In due course, victories were chalked up by Lieutenants Alan Winslow, Douglas Campbell, Jimmie Meissner and a few others, but on the other hand two well-known Americans, Quentin Roosevelt and Raoul Lufbery, were shot down and killed while flying the aircraft.

Suspicious that the French had disposed of a 'dud' aircraft on them, the Americans effected a swift changeover to the SPAD XIII in July 1918, but evidence suggests that the Nieuport XXVIII would have been a thoroughly sound combat aeroplane had it not been for the recalcitrant engines, which reflected all the casual attitudes of French manufacturers during the later months of the war.



A Nieuport XXVIIIC-1 of the 94th Aero Squadron ('Hat in the Ring'), American Expeditionary Force, in May 1918.

Specification

Type: single-seat fighting scout
Powerplant: one 160-hp (119-kW) Gnome 9N nine-cylinder air-cooled rotary piston engine
Performance: maximum speed 196 km/h (122 mph) at 2000 m (6,560 ft); climb to 3000 m (9,845 ft) in 11 minutes 30 seconds; service ceiling 5200 m (17,060 ft); endurance 1 hour 30 minutes
Weights: empty 532 kg (1,173 lb); maximum take-off 737 kg (1,625 lb)
Dimensions: span 8.00 m (26 ft 3 in); length 6.20 m (20 ft 4 in); height 2.50 m (8 ft 2½ in); wing area 20.00 m^2 (215.3 sq ft)
Armament: two fixed 7.7-mm (0.303-in) Vickers machine-guns on nose, synchronized to fire through propeller disc; some American aircraft fitted with Marlin guns or 11-mm (0.43-in) Vickers guns with tracer ammunition for balloon attacks

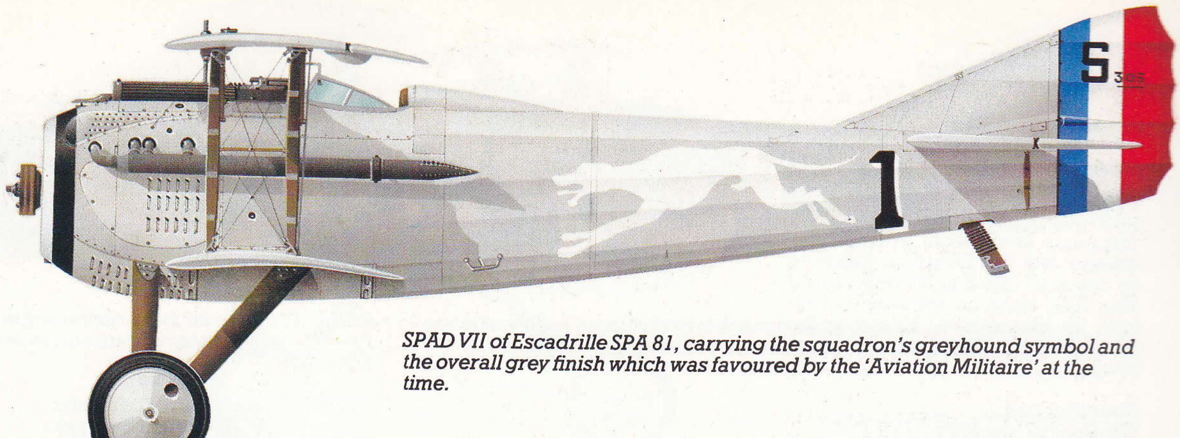
FRANCE

SPAD VII

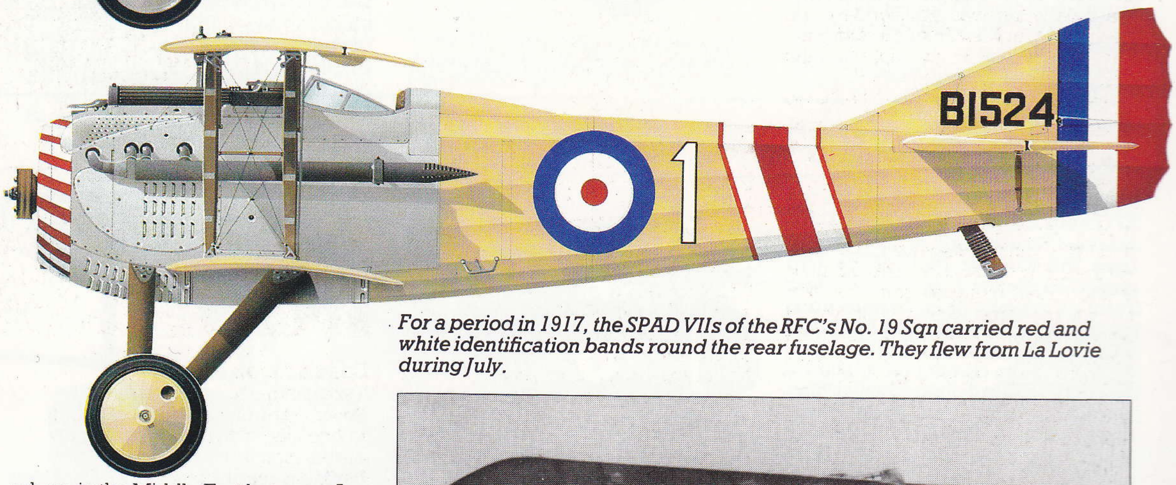
Always known by its initials (derived from the name *Société Anonyme Pour l'Aviation et ses Dérivés*) and perpetuating those of the original Deperdussin company, SPAD produced France's finest wartime scouts, most of which owed their success to Marc Birkigt's classic Hispano-Suiza water-cooled engines, of which the broad-V8 version powered both the **SPAD VII** and XIII. First flown in April 1916, the SPAD VII was immediately acknowledged to be greatly superior to the Fokkers and Albatros scouts which still virtually dominated the Western Front. Initial production orders were conservative, but in due course more than 6,000 SPAD VIIs came to be built, about 220 of them subcontracted in the UK. Designed by Louis Béchereau, who had been the designer with the old Deperdussin company, the SPAD VII featured a structure almost entirely of wood with fabric covering, the big engine being entirely enclosed within the contours of the nose cowling which was liberally provided with louvres to allow exit of cooling air from the large frontal radiator.

The SPAD VII owed its reputation to its early service with that most famous of all French scout units, Escadrille SPA 3 *'Les Cicognes'* (The Storks), led in September 1916 (when the first SPAD VIIs arrived) by Alfred Heurteaux, who was himself an ace and who eventually gained 21 victories, of which about 15 were gained in the SPAD VII. Among SPA 3's other famous pilots were René Dorme (23 victories) and Albert Deullin (20 victories) and, most famous of all, Georges Guynemer. When the first SPAD VII arrived in SPA 3, Guynemer had already reached a victory score of nine; by the end of the year this had risen to 30, and by the following July to 50. Emblazoned with the famous stork motif on the rear fuselage, his SPAD was named *Vieux Charles*.

The SPAD VII served with most of the Allied air forces in the last two years of the war, including the RFC. First British squadron to fly the aircraft in France was No. 19 in December 1916, followed by No. 23 in February 1917 and No. 92 in September. No. 17 Squadron flew SPAD VIIs in the Balkans from July to December 1917, while Nos 30, 63 and 72 Squadrons flew the aircraft in Mesopotamia and elsewhere in the Middle East between August 1917 and late 1918. By and large, however, British pilots achieved less success with the SPAD than their contemporaries in the French air services.



SPAD VII of Escadrille SPA 81, carrying the squadron's greyhound symbol and the overall grey finish which was favoured by the 'Aviation Militaire' at the time.



For a period in 1917, the SPAD VIIs of the RFC's No. 19 Sqn carried red and white identification bands round the rear fuselage. They flew from La Lovie during July.

A SPAD VII of No. 30 Sqn at Baquba, Arabia in mid-1918. These aircraft were used for escorting the RAF squadron's Martinsydes on bombing duties.

Specification

Type: single-seat fighting scout
Powerplant: one 150-hp (112-kW) Hispano-Suiza 8Aa V-8 water-cooled inline piston engine
Performance: maximum speed 192 km/h (119 mph) at 2000 m (6,560 ft); climb to 2000 m (6,560 ft) in 8 minutes 12 seconds; service ceiling 5300 m (17,390 ft); endurance 2 hours 15 minutes
Weights: empty 510 kg (1,124 lb); maximum take-off 740 kg (1,631 lb)
Dimensions: span 7.80 m (25 ft 7¾ in); length 6.15 m (20 ft 2½ in); height 2.12 m (6 ft 11½ in); wing area 17.85 m² (192.14 sq ft)
Armament: one fixed 7.7-mm (0.303-in) Vickers machine-gun on nose, synchronized to fire through propeller disc, and (sometimes) one 7.7-mm (0.303-in) Lewis gun on the top wing

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FRANCE

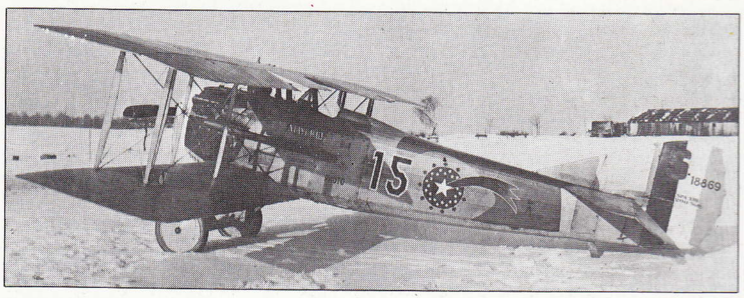
SPAD XIII

If the aircraft of World War I are remembered for their brightly-coloured paint schemes, none were so ludicrously daubed as the **SPAD XIII** fighters of the American Expeditionary Force's 94th Aero Squadron (the 'Hat in the Ring' squadron) which achieved a measure of combat maturity with these aircraft in the last four months of the war.

The SPAD XIII, which first flew in August 1917, was principally distinguished from the earlier SPAD VII in having a geared 220-hp (164-kW) Hispano-Suiza 8Ba engine which drove the propeller in the opposite direction to that of the direct-drive Hispano 8Aa. Other differences lay in the inverse tapered-chord ailerons, rounded tailplane tips and larger vertical tail surfaces.

Despite the shattering blow to French morale with the death of Georges Guynemer, who died in mysterious circumstances while flying one of the first SPAD XIIIs over Poelcapelle in September 1917, the new scout quickly established itself as one of the best Allied aircraft, the great René Fonck reaching his score of 75 victories largely through brilliant marksmanship in the SPAD XIII; one occasion is recorded in which he despatched three enemy aircraft with a total expenditure of just 27 rounds! In the last 14 months of the war the SPAD XIII equipped no fewer than 81 French *escadrilles* as well as numerous units of the Belgian and Italian air service, and Nos 19 and 23 Squadrons of the RFC.

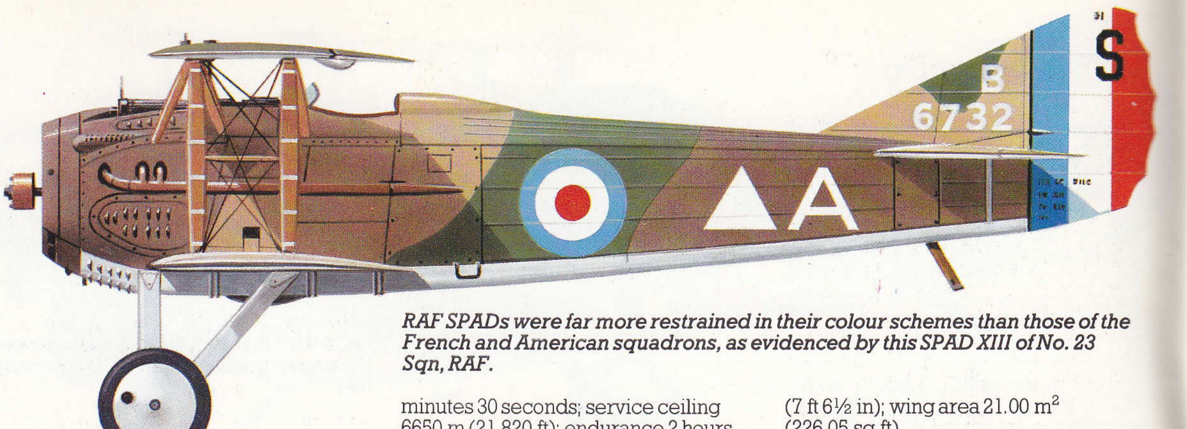
As already mentioned, the Americans decided to adopt the SPAD XIII in July 1918, after experiencing difficulty with the Nieuport 28. The outstanding American pilot was Captain Eddie Rickenbacker of the 94th Aero Squadron. Rickenbacker emerged as top-scoring ace of the Expeditionary Force, and scored very rapidly in the last few weeks of the war. But no American pilot scored faster than the 'maverick' pilot Frank Luke Jr, whose score of 18 included a number of observation balloons destroyed while flying the SPAD XIII. These two pilots, both of whom were awarded the Medal of Honor, were the two outstanding American SPAD pilots, yet it must be pointed out that many other highly successful Americans never served with the Expeditionary Force but achieved



The SPAD XIII featured a larger engine than its predecessor and was consequently faster. This example flew with the American 22nd Aero Squadron in 1918.

SPAD XIII (continued)

their scores exclusively with the RAF, RFC and French air services. Indeed the veteran Raoul Lufbery, considered by many to be America's finest scout pilot, never flew SPADs and, despite crippling rheumatoid arthritis, remained with the Escadrille Lafayette on Nieuport 28s until his death on 19 May 1918, when he was seen to leap from his blazing scout high over the Western Front; few Allied pilots possessed parachutes.



RAF SPADs were far more restrained in their colour schemes than those of the French and American squadrons, as evidenced by this SPAD XIII of No. 23 Sqn, RAF.

Specification
Type: single-seat fighting scout
Powerplant: one 220-hp (164-kW) Hispano-Suiza 8Ba V-8 water-cooled inline piston engine
Performance: maximum speed 215 km/h (133.5 mph) at 2000 m (6,560 ft); climb to 2000 m (6,560 ft) in 6 minutes 30 seconds; service ceiling 6650 m (21,820 ft); endurance 2 hours
Weights: empty 565 kg (1,245 lb); maximum take-off 820 kg (1,807 lb)
Dimensions: span 8.02 m (26 ft 3¾ in); length 6.20 m (20 ft 4 in); height 2.30 m (7 ft 6½ in); wing area 21.00 m² (226.05 sq ft)
Armament: two fixed 7.7-mm (0.303-in) Vickers machine-guns on nose, synchronized to fire through propeller disc

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UK

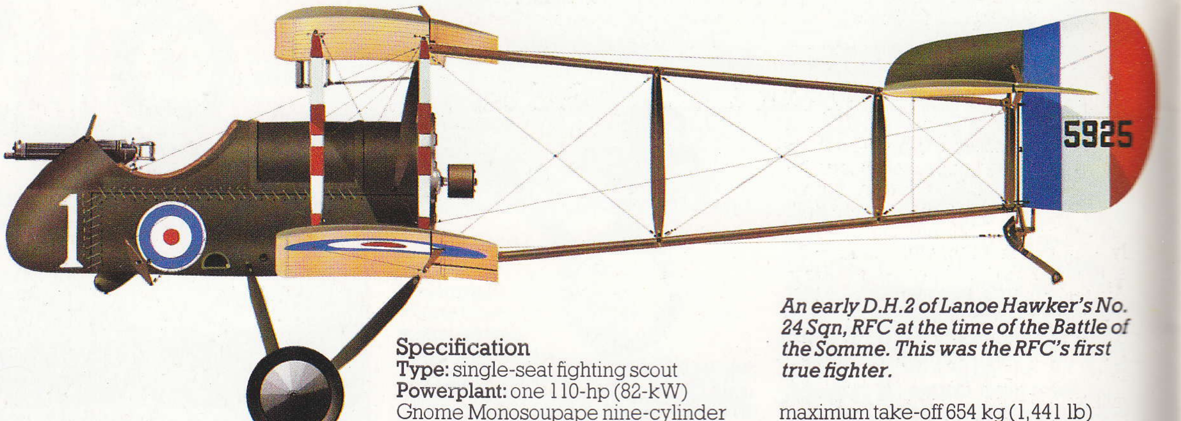
Airco D.H.2

Now generally recognized as the RFC's first true fighter, the **Airco D.H.2** reached France early in 1916. By that time the Fokker monoplane had gained ascendancy over the Western Front on account of its forward-firing machine-gun, to which the RFC had no effective reply as no British interrupter gear had been developed to allow a gun to fire through the propeller disc. Instead the D.H.2, first flown in July 1915, perpetuated the D.H.1's pusher engine layout in which the pilot was seated in the extreme nose. In the new aeroplane he was expected not only to fly the aircraft but also to manhandle his single drum-fed Lewis gun from mounting to mounting, one of which was located on each side of his cockpit. In due course RFC pilots learned to use the Lewis gun as a fixed weapon, aiming the whole aircraft at its target.

Of orthodox fabric-covered wooden construction, the little D.H.2 possessed an all-up weight of no more than 702 kg (1,547 lb) with a Le Rhône engine, the entire tail unit being carried on four struts attached to the wings. Most service aircraft were powered by the 110-hp (82-kW) Gnome rotary driving a two-blade propeller.

First RFC squadron to take its D.H.2s to France was No. 24 Squadron (commanded by Major Lanoe G. Hawker, VC, DSO), which arrived at St Omer with 12 aeroplanes on 7 February 1916. In the next three months Nos 29 and 32 Squadrons followed and these three units participated in the bloody Battle of the Somme, constantly engaging the German Fokker E III monoplanes on fairly equal terms. In due course the type also served with Nos 5, 14, 17, 41, 47 and 111 Squadrons of the RFC, and two aircraft flew with home defence squadrons; one, flown by Captain R.H.M.S. (later Air Marshal Sir Richard, KCB, KBE, MC, DFC, AFC) Saundby of the Orfordness Experimental Station, attacked the German airship *L 48* on 17 June 1917. By early 1917 the D.H.2 was outclassed in France, however, and was withdrawn for service with Nos 17 and 111 Squadrons in Palestine, and with No. 47 Squadron in Macedonia.

In the course of 774 combats by D.H.2s in France, No. 24 Squadron pilots destroyed 44 enemy aircraft. In another fight the commander of No. 32 Squadron, Major (later Group Captain) L.W.B. Rees, OBE, MC, AFC, won the Victoria Cross for his single-handed attack on a formation of 10 German aircraft on 1 July 1916. On 28 October that year the great German fighter pilot, Oswald Boelcke, lost his life when his Albatros collided with another German aircraft during combat with D.H.2s of No. 24 Squadron. A few weeks later, in one of the war's longest air combats, the supreme fighter pilot, Manfred Freiherr von Richthofen, fought and eventually killed Major Lanoe Hawker, No. 24 Squadron's gallant commander.



An early D.H.2 of Lanoe Hawker's No. 24 Sqn, RFC at the time of the Battle of the Somme. This was the RFC's first true fighter.

Specification
Type: single-seat fighting scout
Powerplant: one 110-hp (82-kW) Gnome Monosoupape nine-cylinder rotary piston engine
Performance: maximum speed 150 km/h (93 mph) at sea level; climb to 1980 m (6,500 ft) in 12 minutes; service ceiling 4265 m (14,000 ft); endurance 2 hours 45 minutes
Weights: empty 428 kg (943 lb); maximum take-off 654 kg (1,441 lb)
Dimensions: 8.61 m (28 ft 3 in); length 7.68 m (25 ft 2½ in); height 2.91 m (9 ft 6½ in); wing area 23.13 m² (249.0 sq ft)
Armament: one 7.7-mm (0.303-in) Lewis machine-gun in nose with five 97-round drums of ammunition in cockpit

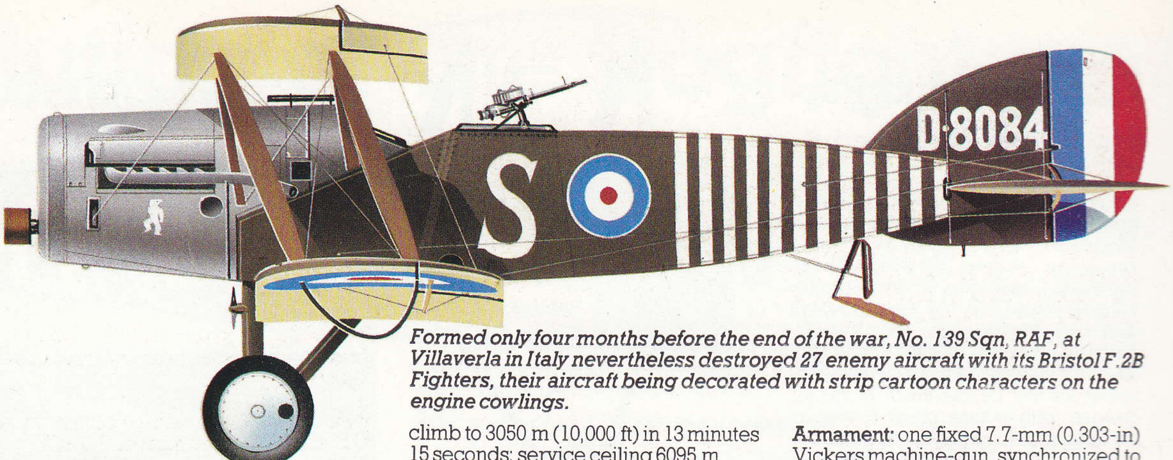
D.H.2s were flown by RFC squadrons (Nos 14 and 111) in Palestine after they had been withdrawn from operational use on the Western front early in 1917.

UK

Bristol F.2B Fighter

The origins of the **Bristol F.2B Fighter** may be traced back to the autumn of 1915 when, following the onset of the 'Fokker scourge', the RFC demanded a reconnaissance aircraft 'capable of taking care of itself' in the presence of enemy fighting scouts. The Royal Aircraft Factory produced the thoroughly unsatisfactory R.E.8 (the 'Arry Tate') of which thousands were built, but at the Bristol works Frank Barnwell started design of his two-seat **R.2A** 'corps reconnaissance' aircraft. From this stemmed his **F.2A** which, fitted with a synchronized Vickers gun forward and a defensive Lewis gun aft, was regarded more as a fighting machine whose primary task would be armed reconnaissance. And thus was born the reconnaissance fighter. The F.2 was a large aeroplane with a span of over 39 ft (11.9 m) in which the fuselage was located midway between upper and lower wings; power was to be provided by the Rolls-Royce Falcon engine, but with the eventual build-up of airframe production the supply of engines could not keep pace. Persistent problems arose with the Falcon, moreover, and many of the alternatives suggested (including the Sunbeam Arab) were used.

The first F.2A squadron of the RFC, No. 48, took its aircraft to France in March 1917, but suffered disastrously in 'Bloody April', only two out of six aircraft returning from the first offensive patrol on 5 April, during the Battle of Arras; the other four had been shot down by Albatros D IIIs of Jasta 11 led by Manfred von Richthofen. Fortunately a revised version, the F.2B, was already in hand with improved lower wing, increased protection for the crew and Scarff ring mounting for the Lewis gun, and with an improved Falcon II engine this new aircraft proved perfectly 'capable of taking care of itself'. In the next few months it re-equipped No. 48 and joined Nos 11, 20 and 22 Squadrons and, being flown as a true dogfighter when attacked by scouts, gave a good account of itself. Top-scoring F.2B crew were the Canadian pilot Lieutenant (later Major) A.E. McKeever and his regular observer Sergeant (later Lieutenant) L.F. Powell of No. 11 Squadron; by the end of 1917, when posted home as an instructor, McKeever had shot down 30 enemy aircraft and Powell's score eventually reached eight. In due course F.2Bs (universally dubbed 'Brisfits') equipped Nos 11, 20, 22, 33, 36, 39, 48, 62, 76, 88 and 141 Squadrons of the RFC/RAF at home and in France, No. 67 Squadron in Palestine, No. 139 Squadron in Italy, and No. 3 Squadron of the Australian Flying Corps in France, as well as being supplied in small numbers to numerous other units. The Bristol fighter survived in RAF front-line service for a dozen years after the war.



Formed only four months before the end of the war, No. 139 Sqn, RAF, at Villaverla in Italy nevertheless destroyed 27 enemy aircraft with its Bristol F.2B Fighters, their aircraft being decorated with strip cartoon characters on the engine cowlings.

Specification

Type: two-seat reconnaissance fighter
Powerplant: one 220-hp (164-kW) Rolls-Royce Falcon II V-12 water-cooled piston engine
Performance: maximum speed 195 km/h (121 mph) at 1525 m (5,000 ft); climb to 3050 m (10,000 ft) in 13 minutes 15 seconds; service ceiling 6095 m (20,000 ft); endurance 3 hours
Weights: empty 866 kg (1,910 lb); maximum take-off 1297 kg (2,860 lb)
Dimensions: span 11.96 m (39 ft 3 in); length 7.87 m (25 ft 10 in); height 2.97 m (9 ft 9 in); wing area 37.68 m^2 (405.6 sq ft)
Armament: one fixed 7.7-mm (0.303-in) Vickers machine-gun, synchronized to fire through propeller disc with Constantinesco CC interrupter gear, and one trainable 7.7-mm (0.303-in) Lewis gun on Scarff No. 2 ring on rear cockpit, plus provision for up to 12 9.1-kg (20-lb) Cooper bombs under lower wing

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UK

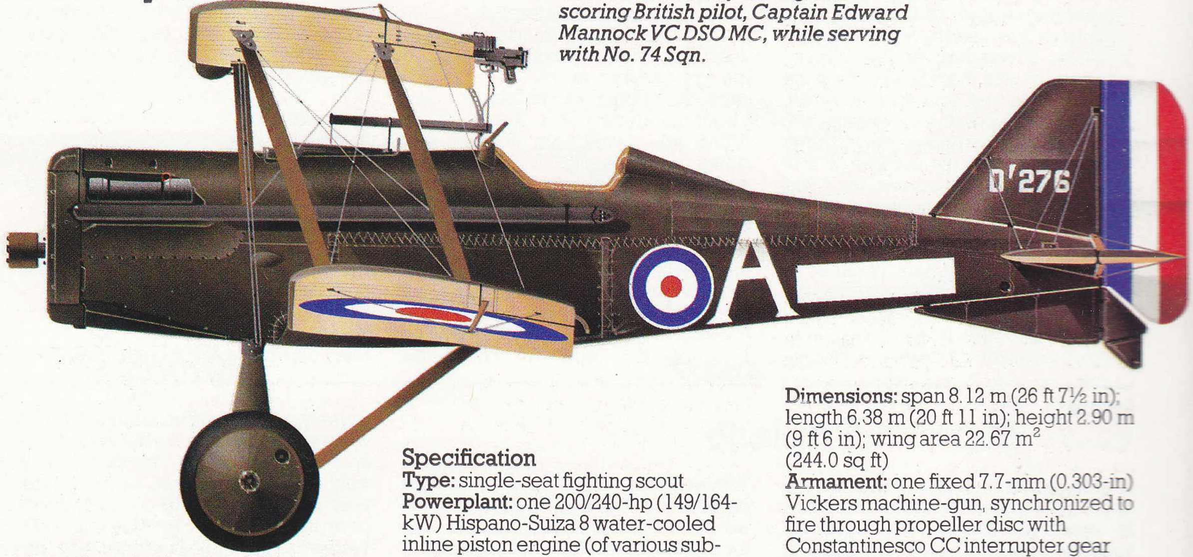
Royal Aircraft Factory S.E.5a

Although conceived at the same time as the **S.E.5**, the improved **Royal Aircraft Factory S.E.5a** followed that aircraft into service some three months later in June 1917 almost simultaneously with the first Sopwith Camels. Designed by H.P. Folland at the Royal Aircraft Factory, Farnborough, in 1916, the aircraft was a beautifully proportioned aeroplane despite its angular lines with semi-rectangular fuselage section and parallel-chord wings and tailplane. Powered by a 200-hp (149-kW) geared water-cooled Hispano-Suiza 8 (which later became the Wolseley Viper), the S.E.5a was dogged in early service by trouble with this engine owing to hastily-manufactured reduction gears, said to have been occasioned by the French Brasier firm's creed that 'engines of incomplete efficiency are better than no engines at all'.

Persistent engine troubles severely delayed production of the S.E.5a and although No. 56 Squadron, RFC, received its first aircraft in June 1917 only five squadrons (Nos 40, 41, 56, 60 and 84), were operating the aircraft by the end of the year, despite the fact that more than 800 S.E.5 and S.E.5a aircraft had by then been completed. The S.E.5a was unusual for its time in being armed with only a single synchronized Vickers gun, to which was added a Lewis gun on a Foster mounting on the top wing, but this slight deficiency in armament (albeit preferred by many pilots) was offset by a high top speed of between 203 and 212 km/h (126 and 132 mph).

Production was widely subcontracted to Austin, Air Navigation Company, Martinsyde, Grahame-White, Vickers, Whitehead and Wolseley, in addition to manufacture at Farnborough. About 5,000 aircraft were prouced, the great majority in 1918, and S.E.5a fighters served on Nos 1, 24, 29, 32, 40, 41, 56, 60, 64, 74, 84, 85, 92 and 94 Squadrons of the RFC and RAF in France, Nos 111 and 145 Squadrons in Palestine, Nos 17, 47 and 150 Squadrons in Macedonia, and No. 72 Squadron in Mesopotamia; they also equipped the 25th and 148th Aero Squadrons of the US Air Service. The most famous of British scout pilots flew the S.E.5 and S.E.5a, of whom the greatest exponent was Major James McCudden, whose total score of 57 air victories included 50 while serving with No. 56 Squadron; Mannock, Bishop, Beauchamp-Proctor and Ball all flew S.E.5 and/or S.E.5a aircraft, although the last-named preferred the Nieuport until eventually becoming reluctantly reconciled to the British aircraft in which he was to lose his life.

The S.E.5a flown by the highest-scoring British pilot, Captain Edward Mannock VC DSO MC, while serving with No. 74 Sqn.



Specification

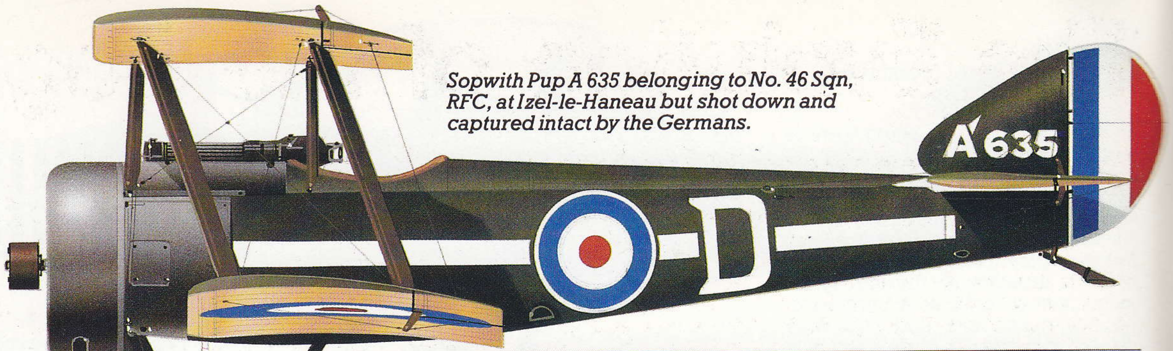
Type: single-seat fighting scout
Powerplant: one 200/240-hp (149/164-kW) Hispano-Suiza 8 water-cooled inline piston engine (of various sub-variants)
Performance: maximum speed 212 km/h (132 mph) at 1980 m (6,500 ft); climb to 3050 m (10,000 ft) in 11 minutes 20 seconds; service ceiling 5790 ~~ft~~ M (19,000 ~~m~~); endurance 2 hours 15 minutes FT.
Weights: empty 696 kg (1,535 lb); maximum take-off 930 kg (2,050 lb)
Dimensions: span 8.12 m (26 ft 7½ in); length 6.38 m (20 ft 11 in); height 2.90 m (9 ft 6 in); wing area 22.67 m^2 (244.0 sq ft)
Armament: one fixed 7.7-mm (0.303-in) Vickers machine-gun, synchronized to fire through propeller disc with Constantinesco CC interrupter gear and 400 rounds, and one trainable 7.7-mm (0.303-in) Lewis gun on Foster mounting on top wing and four 97-round drums

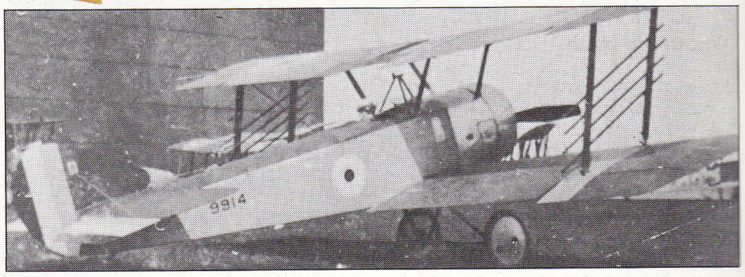
S.E.5as of 'A' Flight, No. 111 Sqn, RAF, serving at Ramleh, Palestine, in 1918; the nearest aircraft is carrying a pair of 20-lb (9-kg) bombs.

UK

Sopwith Pup

Despite all effort by officialdom to the contrary, Herbert Smith's first single-seat scout was known universally as the **Sopwith Pup** for no better reason than that it was so obviously the offspring of the Sopwith 1½-Strutter two-seater. Passed by Sopwith's experimental department in February 1916 on contract to the Admiralty, the prototype Pup, and the next five aircraft (all probably powered by 80-hp/60-kW Clerget rotaries) were delivered for test by the Royal Naval Air Service with whose pilots it was an immediate success. All of them expressed delight with its performance and handling. Production and deliveries were slow to get under way, however, as a result largely of the bickering that broke out between the Admiralty and War Office over priorities, the latter being unable to accept that a commercially conceived design could be superior to one from a government design office, namely the RAF B.E.12 which proved almost useless. At the time of the great Battle of the Somme in mid- to late 1916, RFC squadrons fared badly, and the famous RNAS No. 8 Squadron (or 'Naval Eight') was formed with Pups from units in the Dunkirk area and sent south to assist. So successful was the new squadron that soon both services were crying out for more Pups. By the end of 1916 Nos 54, 46 and 66 Squadrons, RFC, had acquired Pups (now powered by Le Rhône rotaries), and in due course Nos 2, 4, 9, 11 and 12 Squadrons, RNAS, also flew the little scout. As a result of its superb manoeuvrability it avoided the fearsome casualties of other aircraft types during 'Bloody April' 1917 and, despite its relatively modest top speed and single-gun armament, if handled properly was at least a match for such enemy scouts as the Albatros D III, a view expressed by no less an expert than Lieutenant (later Major) James McCudden, who fitted a Lewis gun in his Pup during early attempts to combat the Gotha bombers whose attacks against south east London started during the summer of 1917. Among the successful Pup pilots at this time was Flight Lieutenant H.S. Kerby of the RNAS who, flying from Walmer, shot down a Gotha on 12 August, and another on 21 August. The Pup was also famous for its early flights from warships, and it was Squadron Commander E.H. Dunning who made the first wartime landing on a ship at sea when he landed a Pup on HMS *Furious* on 2 and 7 August 1917; on his third landing the Pup's engine failed and Dunning was drowned. Thereafter Pups pioneered the shipboard use of scouts, and eventually served aboard the early aircraft-carriers, as well as several light cruisers and the capital ships HMS *Repulse* and HMS *Tiger*, being launched from platforms over the gun turrets.


Sopwith Pup A 635 belonging to No. 46 Sqn, RFC, at Izel-le-Haneau but shot down and captured intact by the Germans.


A few Sopwith Pups were equipped with Le Prieur rockets attached to the interplane struts for anti-Zeppelin combat, but none is thought to have been used operationally.

Specification

Type: single-seat fighting scout
Powerplant: one 80-hp (60-kW) Le Rhône nine-cylinder air-cooled rotary piston engine
Performance: maximum speed 179 km/h (111.5 mph) at sea level; climb to 1980 m (6,500 ft) in 8.0 minutes; service ceiling 5335 m (17,500 ft); endurance 3 hours
Weights: empty 357 kg (787 lb); maximum take-off 556 kg (1,225 lb)
Dimensions: span 8.08 m (26 ft 6 in); length 5.87 m (19 ft 3¾ in); height 2.87 m (9 ft 5 in); wing area 23.60 m^2 (254.0 sq ft)
Armament: (normal) one fixed 7.7-mm (0.303-in) Vickers machine-gun on nose, synchronized to fire through propeller disc with Sopwith-Kauper, Scarff-Dibovski or Constantinesco CC interrupter gear; RNAS Pups had one Lewis gun on tripod mounting to fire through top-wing centre-section cut-out; RFC Pups had provision for four 11.3-kg (25-lb) bombs

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UK

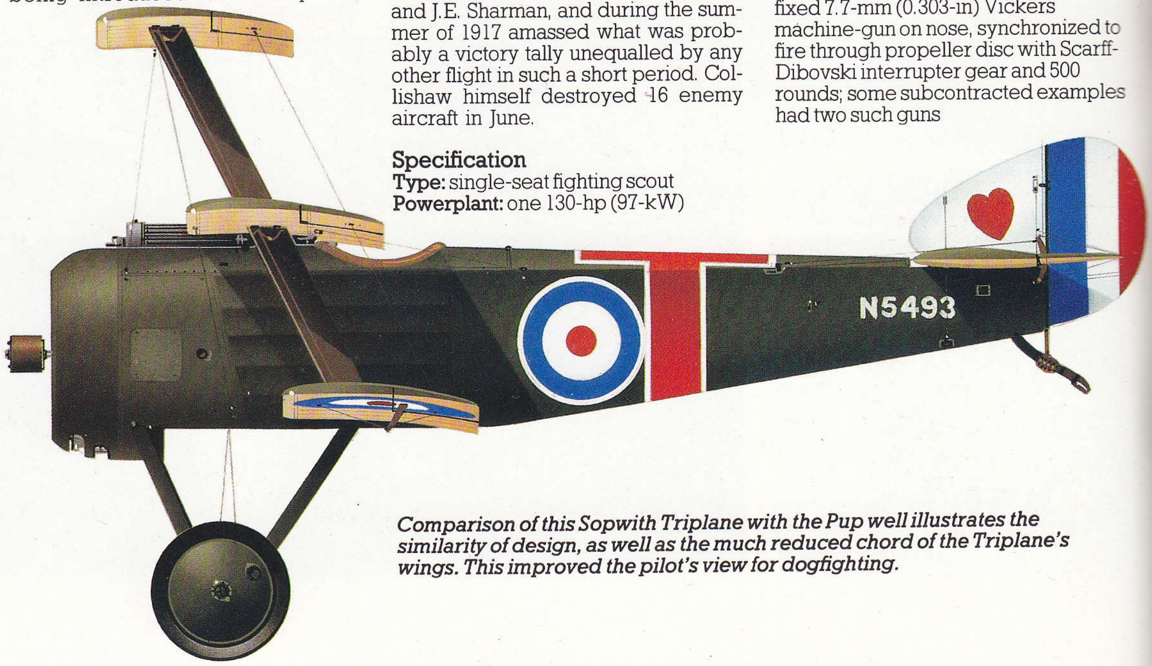
Sopwith Triplane

If Herbert Smith's little Pup was the most appealing combination of aesthetic grace and superb handling chacteristics ever conceived, his **Sopwith Triplane** was an ingenious equation of improved performance and manoeuvrability without significant loss of the splendid design features of the earlier scout. Probably motivated by promise shown by his unattractive three-seat 'Tractor Triplane' (known as the LRTTr), Smith decided to apply the triplane layout to the basic Pup design, employing wings of exactly the same span but of only 99.06-cm (39-in) chord, and single broad I-type interplane and centre-section struts, the latter passing through the roots of the middle wing and fuselage, thereby acting as longeron spacers, bestowing great strength and allowing a minimum of bracing wires. Power was provided by a 130-hp (97-kW) Clerget rotary, and the standard armament was a single synchronized Vickers gun, although some subcontracted Triplanes were armed with a pair of guns. Ailerons were fitted to all wings.

The prototype Triplane passed out of Sopwith's experimental department in May 1916, the test flying being carried out by Harry Hawker at Brooklands. It was then sent to 'A' Squadron, RNAS, in France, for evaluation where it caused a sensation, and was in action within 15 minutes of arrival! Following urgent representations by Sir Douglas Haig, and the appearance of large numbers of Albatros D Is and D IIs, the Triplane was ordered into production for both the RFC and RNAS, but in the event, to the accompaniment of acrimony between the two services, it served regularly only with RNAS units; by early 1917 it was being delivered to Nos 1, 8, 9, 10, 11 and 12 Squadrons, RNAS, Nos 1, 8 and 10 (Naval) Squadrons being attached to the RFC immediately after 'Bloody April' 1917. At about that time an improvement was being introduced to the Triplane, namely a shorter-span tailplane which allowed the scout to be dived vertically. Production of the Triplane totalled only about 150 aircraft, as the Camel was already proving its superiority over the Western Front by mid-1917. Nevertheless the Triplane won undying fame in the hands of 'Black Flight' of 'Naval Ten', led by Raymond Collishaw; with such names as *Black Maria, Black Prince, Black Sheep, Black Death* and *Black Roger*, the Triplanes were flown by Collishaw and fellow Canadians, Flight Sub-Lieutenants W.M. Alexander, G.E. Nash, E.V. Reid and J.E. Sharman, and during the summer of 1917 amassed what was probably a victory tally unequalled by any other flight in such a short period. Collishaw himself destroyed 16 enemy aircraft in June.

Specification

Type: single-seat fighting scout
Powerplant: one 130-hp (97-kW) Clerget 9B nine-cylinder air-cooled rotary piston engine
Performance: maximum speed 188 km/h (117 mph) at 1525 m (5000 ft); climb to 3050 m (10,000 ft) in 11 minutes 50 seconds; service ceiling about 6250 m (20,500 ft); endurance 2 hours 45 minutes
Weights: empty 499 kg (1,101 lb); maximum take-off 699 kg (1,541 lb)
Dimensions: span 8.08 m (26 ft 6 in); length 5.74 m (18 ft 10 in); height 3.20 m (10 ft 6 in); wing area 21.46 m^2 (231.0 sq ft)
Armament: standard aircraft had one fixed 7.7-mm (0.303-in) Vickers machine-gun on nose, synchronized to fire through propeller disc with Scarff-Dibovski interrupter gear and 500 rounds; some subcontracted examples had two such guns


Comparison of this Sopwith Triplane with the Pup well illustrates the similarity of design, as well as the much reduced chord of the Triplane's wings. This improved the pilot's view for dogfighting.

The Evolution of the Dogfight

New skills had to be evolved by pilots to make best use of the greatly increased fighting ability of the aircraft. Failure to master the techniques was almost invariably fatal.

The evolution of aerial dogfighting during World War I was as much the result of increasing flying experience and improved pilot training as of the progressive improvement of aircraft design. Some of the earliest attempts to strike down opponents were dictated by improvization and ingenuity, as witness the resort to a trailing grapnel employed by the Russian pilot Kazakov in attempts to remove his adversary's top wing. Only with the mounting of a machine-gun in the aircraft did the evolution of fighting tactics really begin, a process of jockeying into a position from which the gun could be brought to bear while remaining immune from defensive fire. Thus the first classic manoeuvre was the *stern stalk*, with the attacker approaching unseen beneath the victim's tail; from this position the attacking fighter, whose forward gun could in any case only fire above the propeller, could deliver a lethal burst into the underside of its target with little or no deflection.

Interrupter gear

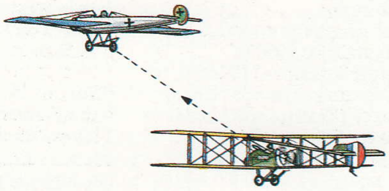
With the introduction of the gun interrupter gear, which allowed the forward gun(s) to be aimed directly along the attacker's flight path, the whole art of dogfighting advanced, and the Germans (with their Fokker monoplanes) gained a lead in tactics that dominated the air war over the Western Front from mid-1915 until well into 1916. A favourite tactic was the use of a decoy which made feinting attacks just out of range on the beam quarters of the target while, unseen by the defending crew, a scout with synchronized gun would *dive out of the sun* to deliver the coup de grâce.

These tactics gave rise to the first two golden rules of air combat, namely 'Beware of the Hun in the sun', and 'He who has height wins the fight'. Until fairly late in 1916 few fighting scouts possessed sufficient engine power to employ manoeuvres in the vertical plane without fatal loss of speed and control, so that attackers tended to make a single firing pass with front gun before diving away to safety. With the arrival of such aircraft as the Albatros D II and Pup, power/weight ratios increased so that more and more manoeuvring could be effected by climbing turns, with the result that air combats became protracted affairs, and it was at about this time that *Immelmann* introduced in the Fokker E III the famous climbing turn (in effect a half roll off the top of a loop) that came to bear his name. It was, however, seldom used as a dogfighting manoeuvre but more as a means of escape from an attack from the rear.

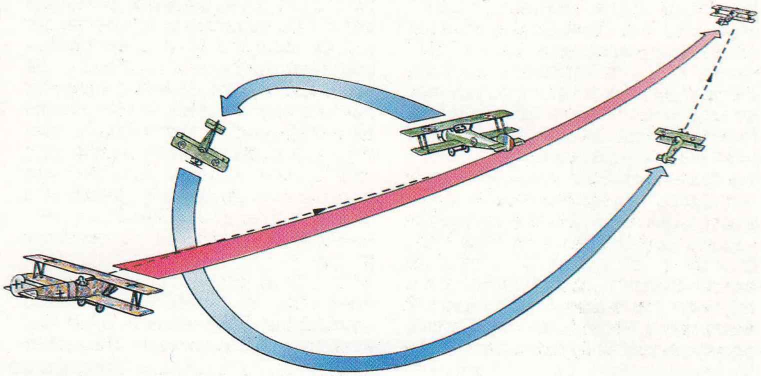
Much more practical was the *snap turn* (a manoeuvre which was facilitated either to left or right by the engine's gyroscopic torque) and this formulated the next rule of combat, 'Always turn towards your attacker'. Thus when beset by an attack from, for instance, the rear port quarter the vital action was to turn sharply to port, thereby increasing the attacker's deflection angle and forcing him either into a tighter turn or to break away.

Refinements of basic manoeuvres

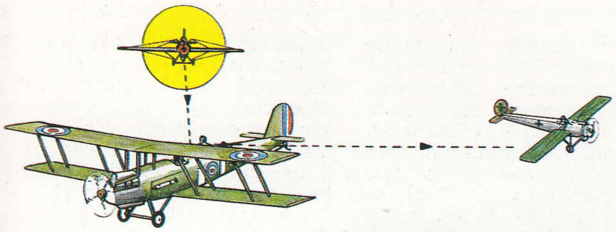
As air combat became more and more the functions of flying skill, physical fitness, sharp reactions, keen eyesight and good deflection shooting judgement, so the art of dogfighting came to embrace developments of the basic flying manoeuvres, and the *'split-S'* and *'Lufbery'* came to be employed by the more experienced pilots. Although these never achieved specific definition (owing to individual variations in interpretation) they were essentially variations and extensions of the snap turn in which the target pilot executed several reversing sharp turns so as to force his attacker to overshoot and thus to put him in a firing position on his tail. The Lufbery was a variation of this, but introduced climbing or diving turns, and it was widely averred that the SPAD XIII, as flown by many American pilots in the last year of the war, was the perfect aeroplane to execute this manoeuvre.



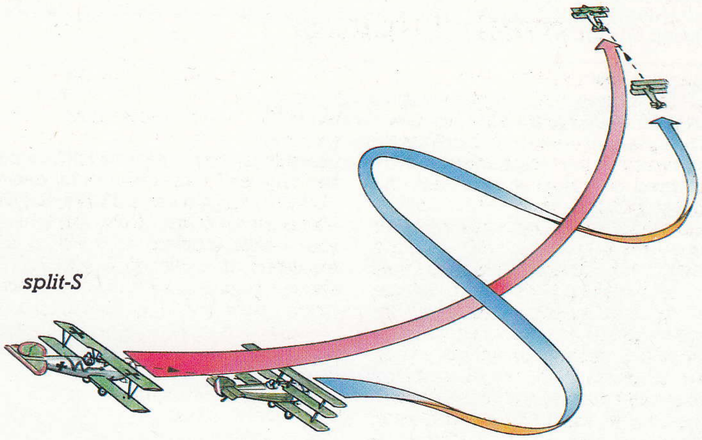
stern stalk



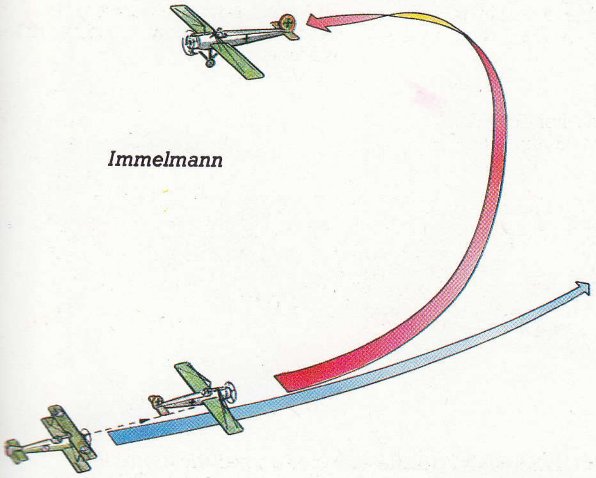
snap turn



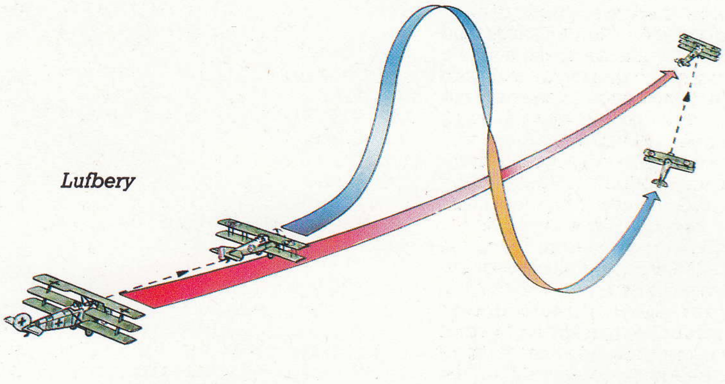
decoy and dive out of the sun



split-S



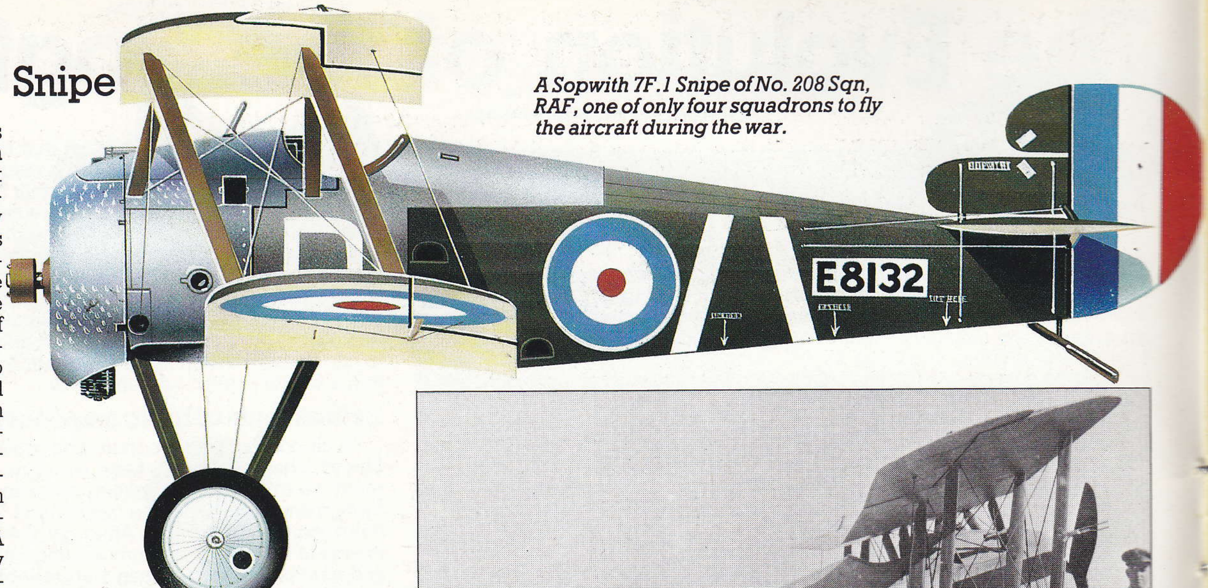
Immelmann



Lufbery

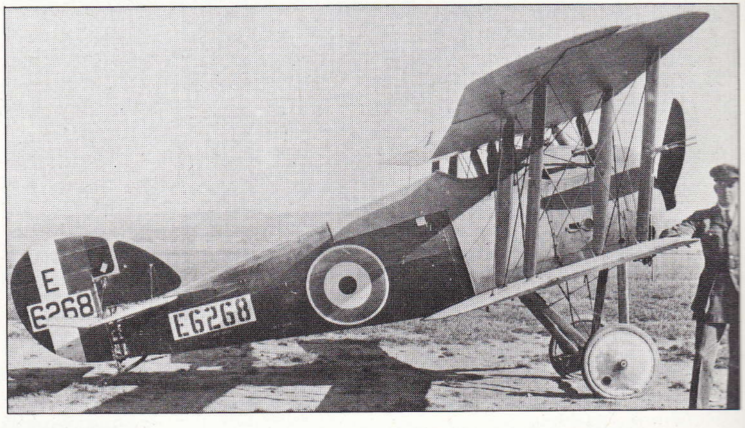
UK

Sopwith 7F.1 Snipe



A Sopwith 7F.1 Snipe of No. 208 Sqn, RAF, one of only four squadrons to fly the aircraft during the war.

The ultimate in wartime fighting scouts to reach service status, the **Sopwith 7F.1 Snipe** flew over the Western Front just in time to demonstrate its superiority over all comers, gaining immortality through one epic air battle in the hands of Major W.G. Barker. Intended originally as a relatively simple derivative of the excellent Camel, the prototype Snipe retained the single-bay wings of the earlier aircraft with some modification to the vertical tail in an effort to overcome the Camel's lateral control deficiences. This aircraft was flown well before the end of 1917, but subsequent aircraft employed W. O. Bentley's B.R.2 rotary engine which delivered 230 hp (172 kW) compared with the B.R.1's 150 hp (112 kW), necessitating further increase in fin area. A change was also made to two-bay wings of greater span to enable a greater military load to be carried. As originally tested the Snipe had a Lewis gun in addition to the customary twin Vickers on the nose, but the former was discarded as superfluous. One of the prototypes went to France in February 1918, where it received enthusiastic reports from service pilots. Production orders for 1,700 Snipes were quickly placed, but it was not until September that the first RAF squadrons in France received their initial deliveries, and No. 43 Squadron did good work escorting the Airco D.H.9s of No. 107 Squadron during the last six weeks of the war. Of the three other squadrons to receive Snipes before the Armistice (Nos 78 and 208 of the RAF, and No. 4 of the Austrian Flying Corps) only the last was able to prove the Snipe's undisputed superiority, shooting down 36 enemy aircraft in four days (including 13 in a single day). It was Major Barker who, ordered to ferry a new Snipe to France and remain attached to No. 201 (Camel) Squadron for a fortnight, took the new scout into the headlines. Unable to find combat during the stipulated fortnight, he was already preparing to return home when, as a last resort, he decided to seek enemy aircraft over the Forêt de Mormal on 27 October. He shot down a two-seater and was then attacked by 15 Fokker D VIIs. Wounded in the thigh, he shot down one of his attackers but fell into a spin; recovering from this he found himself among another group of a dozen D VIIs, one of which he destroyed before being hit in the elbow and again spinning down. He eventually shot his way out of a further group of enemy scouts before crash-landing near a British observation balloon. Barker survived to be awarded the Victoria Cross and his aircraft was recovered and shipped over to his native Canada for permanent preservation and display.



A Boulton & Paul-built Snipe, probably completed only a few days before the war's end. The Snipe was a very capable fighter but was too late to see much action. The aircraft carried on for some years after the war in front-line RAF service.

Specification

Type: single-seat fighting scout
Powerplant: one 230-hp (172-kW) Bentley B.R.2 nine-cylinder air-cooled rotary piston engine
Performance: maximum speed 195 km/h (121 mph) at 3050 m (10,000 ft); climb to 3050 m (10,000 ft) in 9 minutes 25 seconds; service ceiling 5945 m (19,500 ft); endurance 3 hours
Weights: empty 595 kg (1,312 lb); maximum take-off 916 kg (2,020 lb)
Dimensions: span 9.14 m (30 ft 0 in); length 6.05 m (19 ft 10 in); height 2.90 m (9 ft 6 in); wing area 25.18 m^2 (271.0 sq ft)
Armament: two 7.7-mm (0.303-in) Vickers machine-guns on nose with Sopwith-Kauper interrupter gear to fire through propeller disc, plus provision for four 11.3-kg (25-lb) bombs

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UK

Sopwith F.1 Camel

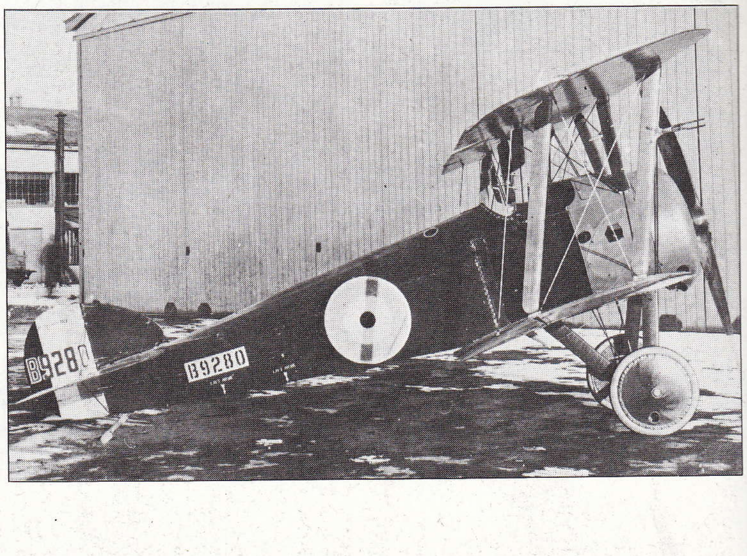
Following what were universally accepted as 'pilots' aeroplanes', the Pup and Triplane, Herbert Smith's classic **Sopwith Camel** possessed none of the natural grace of the earlier aircraft, yet exuded the power and spite of a fighting machine. In demanding constant watchfulness of its particular traits, it could and did sort the men from the boys. Its capacity to turn with incredible sharpness stemmed largely from the concentration of propeller, engine, pilot, armament and fuel within the front 1.8 m (6 ft) of the aircraft, together with tremendous engine torque and gyroscopic couple. When originally conceived, the **Biplane F.1** was intended to feature equal dihedral on top and bottom wings but, for ease of manufacture, the top wing was made flat and the dihedral of the lower wings arbitrarily doubled, thereby giving to the Camel its distinctive 'tapered gap'. Its name was said to have derived from its characteristic 'hump' over the breeches of the twin Vickers guns, which in turn obviated the need for a windscreen.

Various engines were flown in Camels: 130- and 140-hp (97- and 104-kW) Clergets, the 110-hp (82-kW) Le Rhône, the 150-hp (112-kW) Bentley B.R.1, and the 100- and 150-hp (75- and 112-kW) Gnome Monosoupapes.

The prototype (with 110-hp/82-kW Clerget 9Z) was completed in December 1916 and was followed by examples for both the RFC and RNAS, the first two squadrons of the former service, Nos 70 and 45, being re-equipped in July 1917. By the end of that year 1,325 F.1 Camels had been completed (of which most were Clerget- and Le Rhône-powered), and early the following year deliveries of the **2F.1 Camel** shipboard variant started. Subcontracting of production was widely undertaken throughout England and before the end of the war Camels served with Nos 3, 28, 43, 45, 46, 54, 65, 70, 71, 73 and 80 Squadrons of the RFC on the Western Front; Nos 28, 45 and 66 Squadrons in Italy; Nos 151 and 152 night-fighting squadrons of the RFC; Nos 1, 3, 4, 6, 8, 9, 10 and 12 Squadrons, RNAS (later with numbers increased by 200 in the RAF"); Nos 220, 221, 222, 223, 224, 225, 226 and 227 Squadrons of the RAF's Adriatic and Aegean groups, and many other units; they also flew with the RAF's contingent in Russia at Archangel and with the Slavo-British Aviation Group, as well as the US Air Service's 17th Aero Squadron in France. Among the famous fighting exponents of the Camel were Raymond Collishaw (a total of 60 victories), Major D.R. McClaren (54), Major W.G. Barker (53) and Captain H.W. Wollatt (35).

Specification

Type: single-seat fighting scout
Powerplant: one 150-hp (112-kW) Bentley B.R.1 nine-cylinder air-cooled rotary piston engine
Performance: maximum speed 187 km/h (116.5 mph) at 1980 m (6,500 ft); climb to 3050 m (10,000 ft) in 9 minutes 25 seconds; service ceiling 6095 m (20,000 ft); endurance 2 hours 30 minutes
Weights: empty 443 kg (977 lb); maximum take-off 667 kg (1,471 lb)
Dimensions: span 8.53 m (28 ft 0 in); length 5.64 m (18 ft 6 in); height 2.59 m (8 ft 6 in); wing area 21.46 m^2 (231.0 sq ft)
Armament: two fixed 7.7-mm (0.303-in) Vickers machine-guns on nose with interrupter gear, plus racks for four 20-lb (9.1-kg) Cooper bombs under the fuselage



This photograph serves to emphasize the concentration of weight in the short front fuselage, so characteristic of the Camel. This aircraft has had its guns removed.

Sopwith Camel in Action

Nobody could call the Sopwith Camel a graceful aircraft; nor was it easy to fly. Unforgiving in experienced hands, it had one major virtue: it was the most ferocious dogfighter of the war. RFC and RAF Camels alone scored 2880 confirmed victories, far more than any other Allied fighting scout.

Occupying in the affections of World War I scout pilots the same spot as the Supermarine Spitfire in those of a later generation of fighter pilots, the Sopwith Camel was without argument the epitome of classic fighting scouts of the war. Yet, like so many thoroughbreds it could be temperamental and was unforgiving of careless attention in the air, the docile handling of its forebear, the Pup, having been lost in the process of development. Once mastered, however, the Camel was indeed a deadly little fighter; all that was required to change direction quickly in a fight was to pull the nose up, cut the engine and stall turn by use of all controls, and the aeroplane would flick round, especially to the left. Some pilots needing to turn to the right would opt to turn 270° to the left, such was the astonishing speed with which it flicked round! But at the stall, unlike the S.E.5 which was rigged symmetrically and stalled gently without wing drop, the Camel, which had wing incidence washed-out on one side to counteract engine torque, stalled sharply, with a wing dropping into a spin.

Sadly the Camel arrived over the Western Front just too late to avert the catastrophe of 'Bloody April' in 1917, but flew offensive patrols during the 3rd Battle of Ypres which opened on 31 July that year. Indeed, ground-strafing featured prominently in the work performed by Camels over the front, particularly by the aircraft of Nos 3, 28, 46 and 70 Squadrons; casualties were very heavy, losses frequently exceeding 30 per cent, and it was this high rate of attrition that delayed the build-up of Camel strength in France until the end of 1917.

Camel gains respect

It was as a dogfighter that the Camel excelled, however, and long before the end of 1917 the Germans had acquired a healthy respect for the stubby little scout which was easily recognizable from afar by the sharply-tapering wing gap (bestowed by marked dihedral on the lower wing). For example, on 24 March 1918, at the beginning of the big German offensive which was launched in an effort to break the fixed-front deadlock before the Americans could tip the balance, and when the skies over the front filled with swarms of Albatros and Fokker scouts, the pickings were there for those with the stomach for a fight; Captain J.L. Trollope, a Camel pilot of the RFC's No. 43 Squadron, shot down three enemy aircraft in the morning and three more in the afternoon. This record was equalled by another No. 43 Squadron pilot, Captain H.W. Wollatt, who on 12 April also destroyed three German aircraft before lunch and three afterwards. Only nine days later Captain A. Roy Brown, a Canadian Camel pilot on No. 209 Squadron, shot down a red Fokker Dr I near Corbie; when ground parties reached the wreckage they found the body of Manfred Freiherr von Richthofen, Knight of the *Ordre Pour le Mérite*, and victor of 80 air combats. When Brown landed at Bertangles his Camel was found to have 50 bullet holes in it.

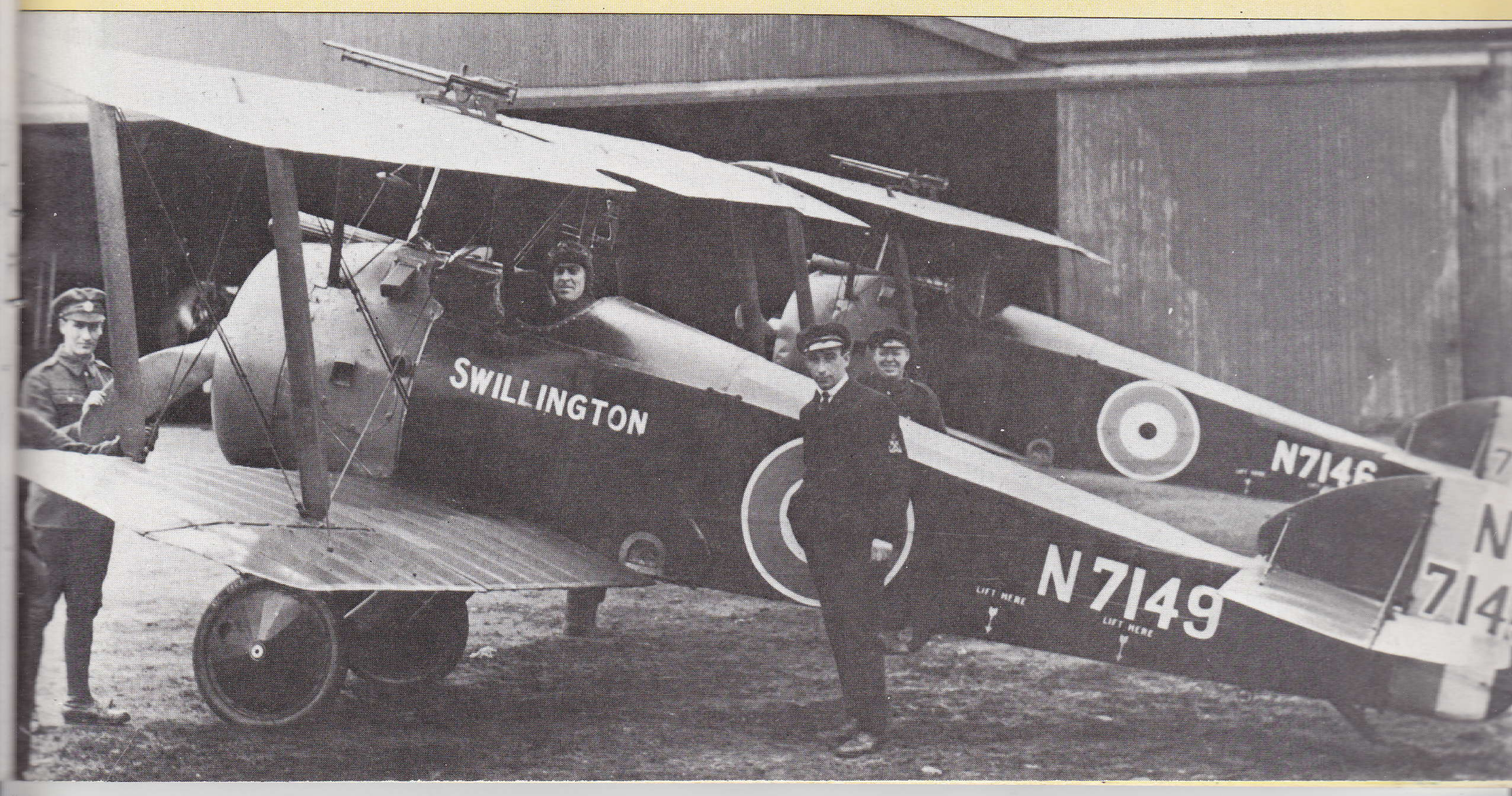
Overseas service

Although the Western Front was the Camel's principal killing ground, the little fighter was active in almost every other war theatre. Some, for instance, went to Russia in 1918 to be flown by the Slavo-British Aviation Group against the Bolsheviks, and one was flown with tremendous skill by the veteran Russian ace, Alexander Kazakov who, after his action at Siy Convent in October, was awarded the DSO and promoted major in the British army, Alas, as maintenance of the various foreign aircraft became more difficult owing to a lack of spares, this gallant pilot was killed when his Camel broke up in the air a year later over Bereznik.

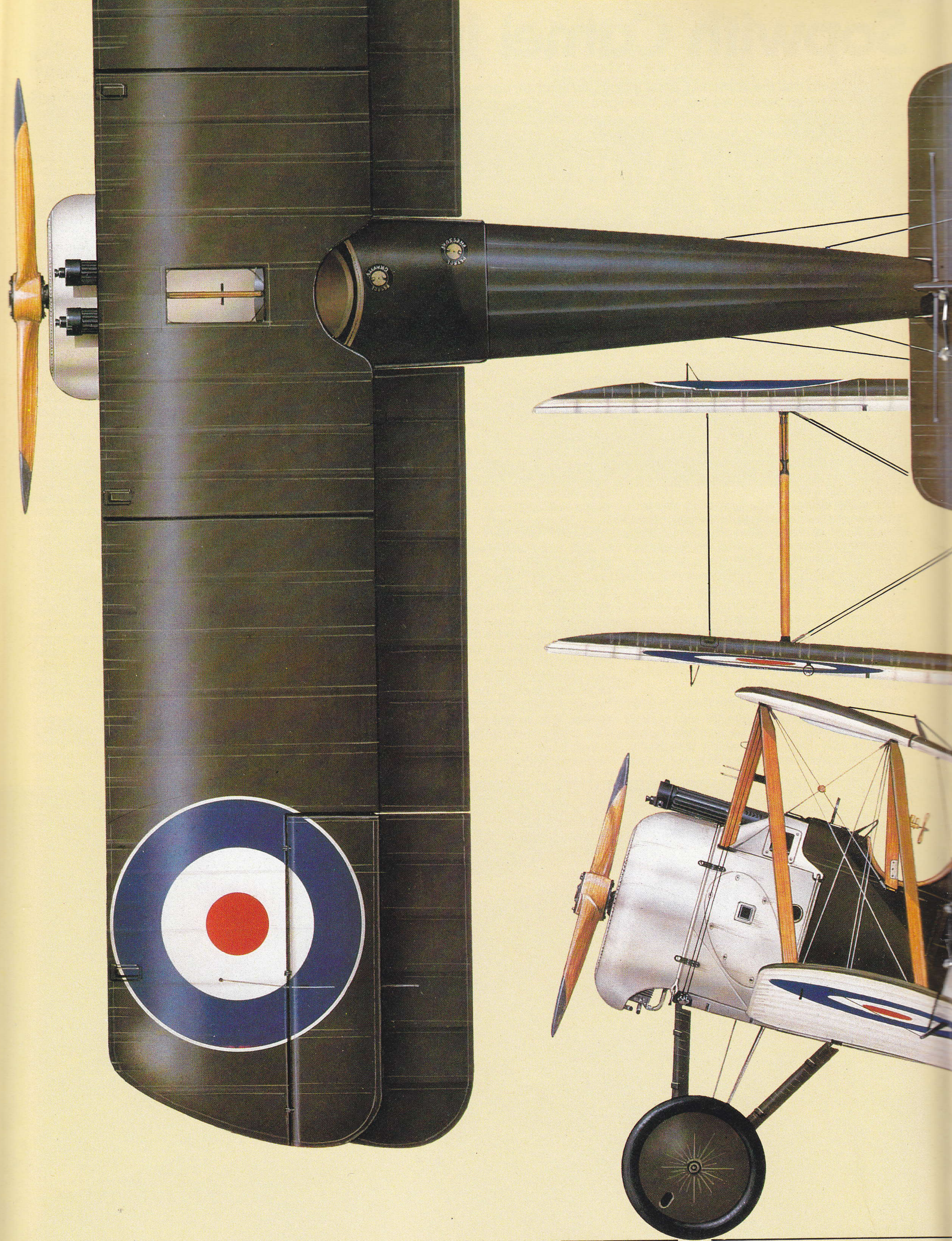
Second only to France, the Italian front was the theatre where Camels also saw distinguished service for, following the débâcle at Caporetto on 24 October 1917, the RFC was ordered to deploy three Camel squadrons (Nos 28, 45 and 66) in north Italy. On 30 March 1918 three No. 66 Squadron pilots, Captain P. Carpenter and Lieutenants H. Eycott-Martin and A. Jerrard, were about to attack an Austrian aerodrome when they were set upon by five Albatros scouts, of which Jerrard shot one down. The Camel pilots then got on with their attack on the aerodrome as the Austrians reformed for battle. Eventually 19 enemy aircraft attacked the three Camels, each of whose pilots downed one opponent. Eight aircraft then concentrated on Eycott-Martin and Jerrard went to his aid, shooting down another Austrian and engaging the enemy's attention while his fellow pilots made good their escape. Finally, his own Camel in tatters and with controls all but shot away, Jerrard was obliged to land and surrender. His award of the Victoria Cross (the only one made to a Camel pilot) was announced on 1 May.

William Barker

If only one Victoria Cross was awarded to a pilot for combat in a Camel, another famous RFC pilot, who also received the UK's highest gallantry award, shot down more than 40 enemy aircraft at the controls of a single Camel, surely a record unequalled by any other fighter in history. William Barker, a native of Manitoba in Canada, had already shot down a Roland and held the Military Cross in 1917 when he was appointed a flight commander on No. 28 Squadron in France. In his Camel (B6313) he shot down five more German aircraft before accompanying the squadron to Italy, arriving at Milan on 12 November. By the end of March 1918 he and B6313 had shot down 19 further enemy aircraft, and Barker had been awarded the DSO. In April he took over command of No.

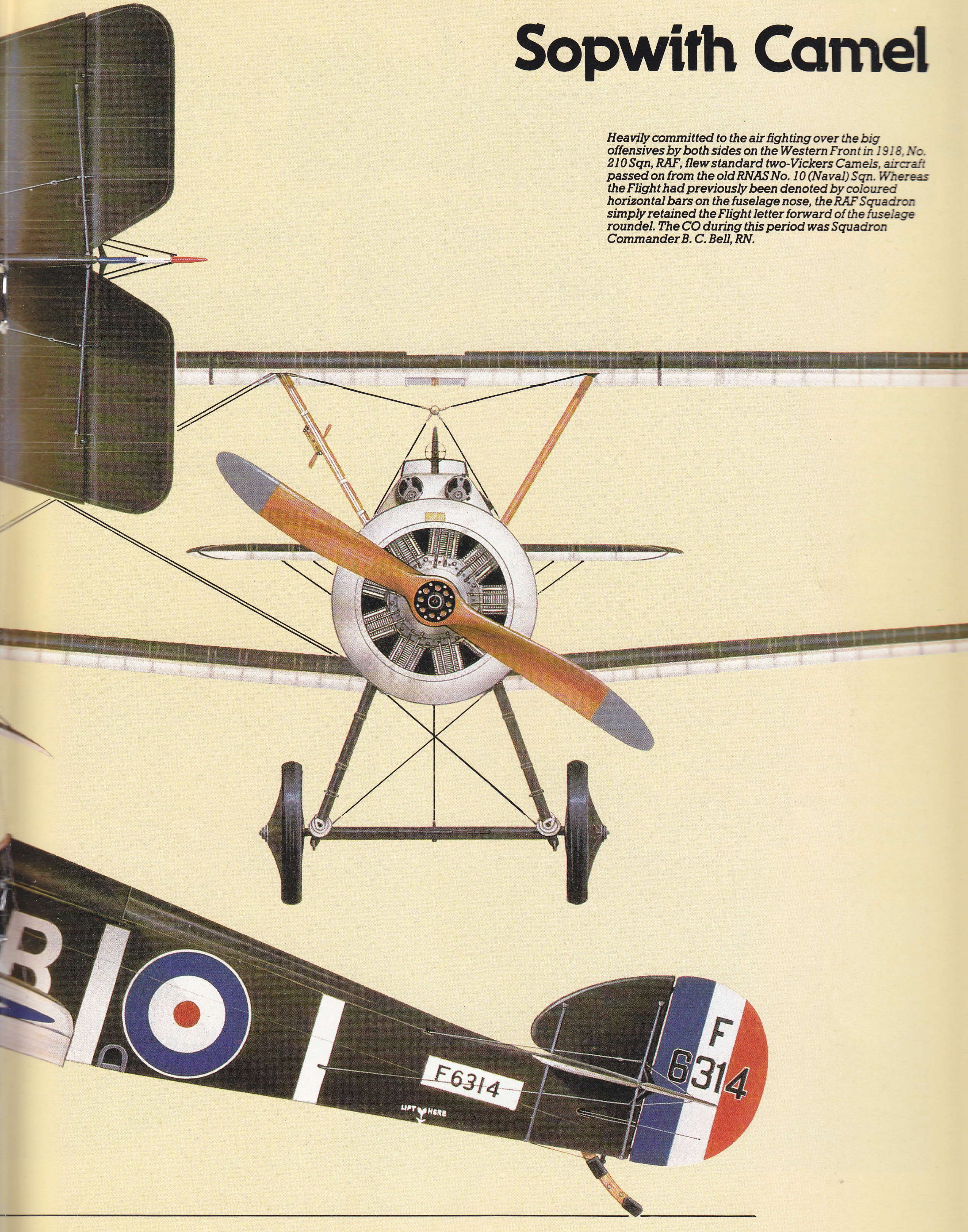


A pair of Beardmore-built 2F.1 Camels based at Turnhouse in 1918 for defence against airship attacks; this naval version had one Vickers and one Lewis gun on the upper wing.



Sopwith Camel

Heavily committed to the air fighting over the big offensives by both sides on the Western Front in 1918, No. 210 Sqn, RAF, flew standard two-Vickers Camels, aircraft passed on from the old RNAS No. 10 (Naval) Sqn. Whereas the Flight had previously been denoted by coloured horizontal bars on the fuselage nose, the RAF Squadron simply retained the Flight letter forward of the fuselage roundel. The CO during this period was Squadron Commander B. C. Bell, RN.



Camel supplied to the Groupe de Chasse Belge and flown by the Belgian ace Jan Olieslagers; this pilot's official score was six victories but, because he never claimed aircraft which fell in enemy territory, his actual tally was obviously much higher.

A Sopwith F.1 Camel in post-Armistice colour scheme; with guns removed, it was probably serving as a trainer or hack aircraft.

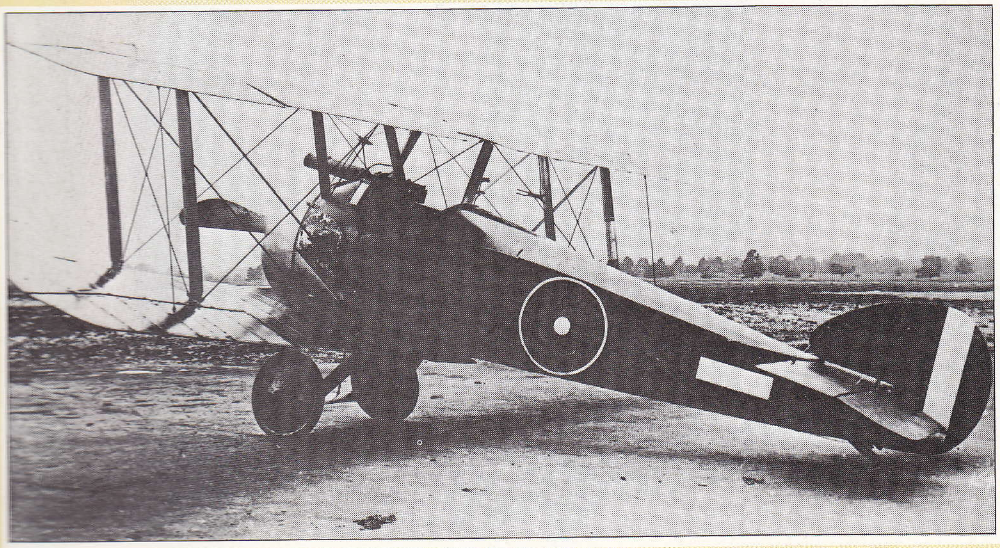
Painted with 'eagle's plumage' on the wings and given prominent 'eyes' on the engine cowling, this was the 1,000th Camel built by Ruston, Proctor & Co Ltd, Lincoln.

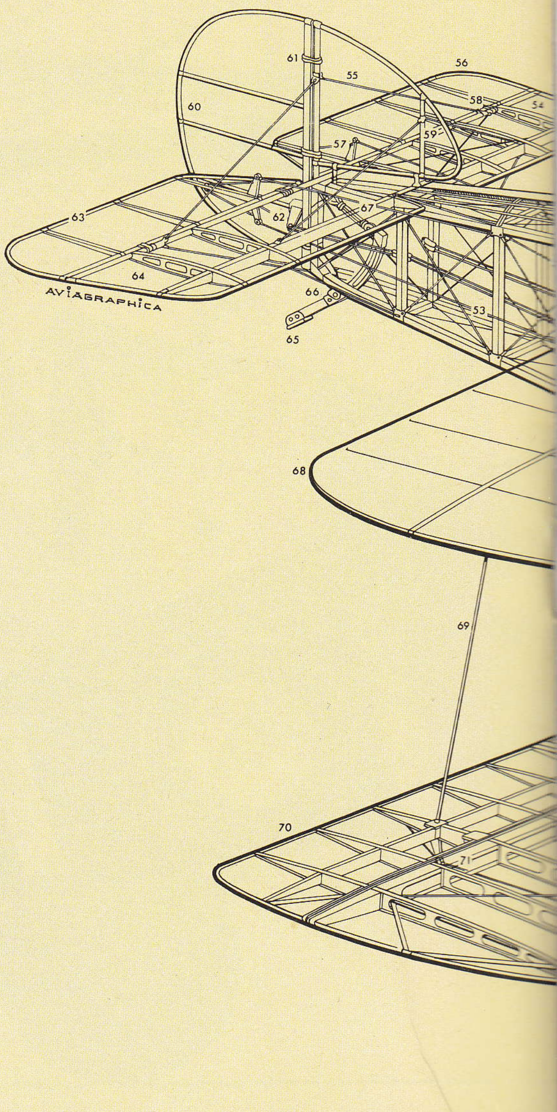
66 Squadron, but retained his favourite Camel, downing 16 Austrian aeroplanes in three months, for which he received another MC and the Italian Silver Medal for Valour. Barker was then given command of a Bristol Fighter squadron, No. 139, but again opted to keep his Camel, in which he went on to destroy six more opponents. In September Barker was posted home to England, and B6313 was deemed to be worn out and had to be scrapped; in it Barker had gained 46 combat victories. (In the last month of the war Barker was ordered to take one of the new Sopwith Snipes, a direct descendant of the Camel, to France. In an epic single-handed combat on 27 October 1918, which earned him the VC, he fought a large number of Fokker D VIIs, estimated at more than 40, over the Forêt de Mormal and, despite numerous severe wounds, shot five down before crashlanding. Barker survived the war with VC, DSO and Bar, MC and two Bars, *Légion d'Honneur*, *Croix de Guerre*, and two Italian Silver Medals for Valour, a collection of gallantry awards only surpassed by that of 'Mick' Mannnock, and went into business with fellow Canadian ace, Billy Bishop; he was killed in a flying accident on 12 March 1930.

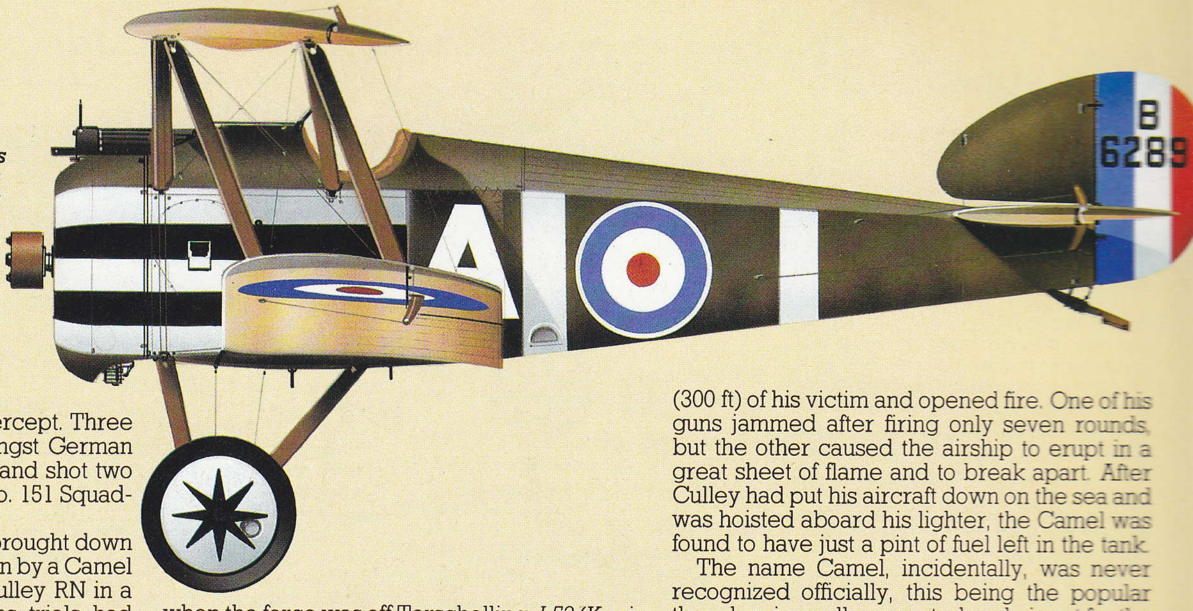
Tricky though the Camel might be to the less initiated, in the hands of an experienced pilot it was thus shown to be a deadly weapon. And its special tricks might be thought too difficult to master at night, yet the Camel it was that pioneered the art of night fighting (although earlier aircraft had flown against German Zeppelin airship raiders). Three Camel pilots of No. 44 Squadron, Major G.W. Murlis Green, Captain C.J.Q. Brand and Lieutenant C.C. Banks had, since September 1917, been flying their aircraft at night in the hope of intercepting the German Gotha bombers which were carrying out sporadic raids over south east England. It was Murlis Green who, on the night of 18 December, despite being temporarily blinded by the flashes from his own guns, put one engine of a Gotha out of action, the enemy bomber crashing near Folkestone when its other engine failed. But it was Banks and another No. 44 Squadron pilot, Captain G.H. Hackwill, who on the night of 25 January 1918 were the first to shoot down an enemy aeroplane at night by direct action, bringing down a Gotha in flames at Wickford. Captain Brand gained his first victory while serving with No. 112 Squadron on 19/20 May 1918 when he shot another Gotha down over Faversham. Of these illustrious Camel pilots, Brand (as an Air Vice-Marshal) brilliantly commanded a Fighter Command group in the Battle of Britain 22 years later, at the same time that Murlis Green was commanding a fighter station.

These were but the first of numerous night victories by Camels, and in August their pilots began flying what in a future war would be termed intruder attacks. On the night of 21/22 August four No. 151 Squadron Camels bombed the enemy aerodromes at Offoy and Moislains, and another pilot of the squadron shot down a

Seen at Martlesham Heath in October 1917, this Camel was fitted with a 150-hp (112-kW) Gnome Monosoupape engine. The markings are those of the United States Air Service.







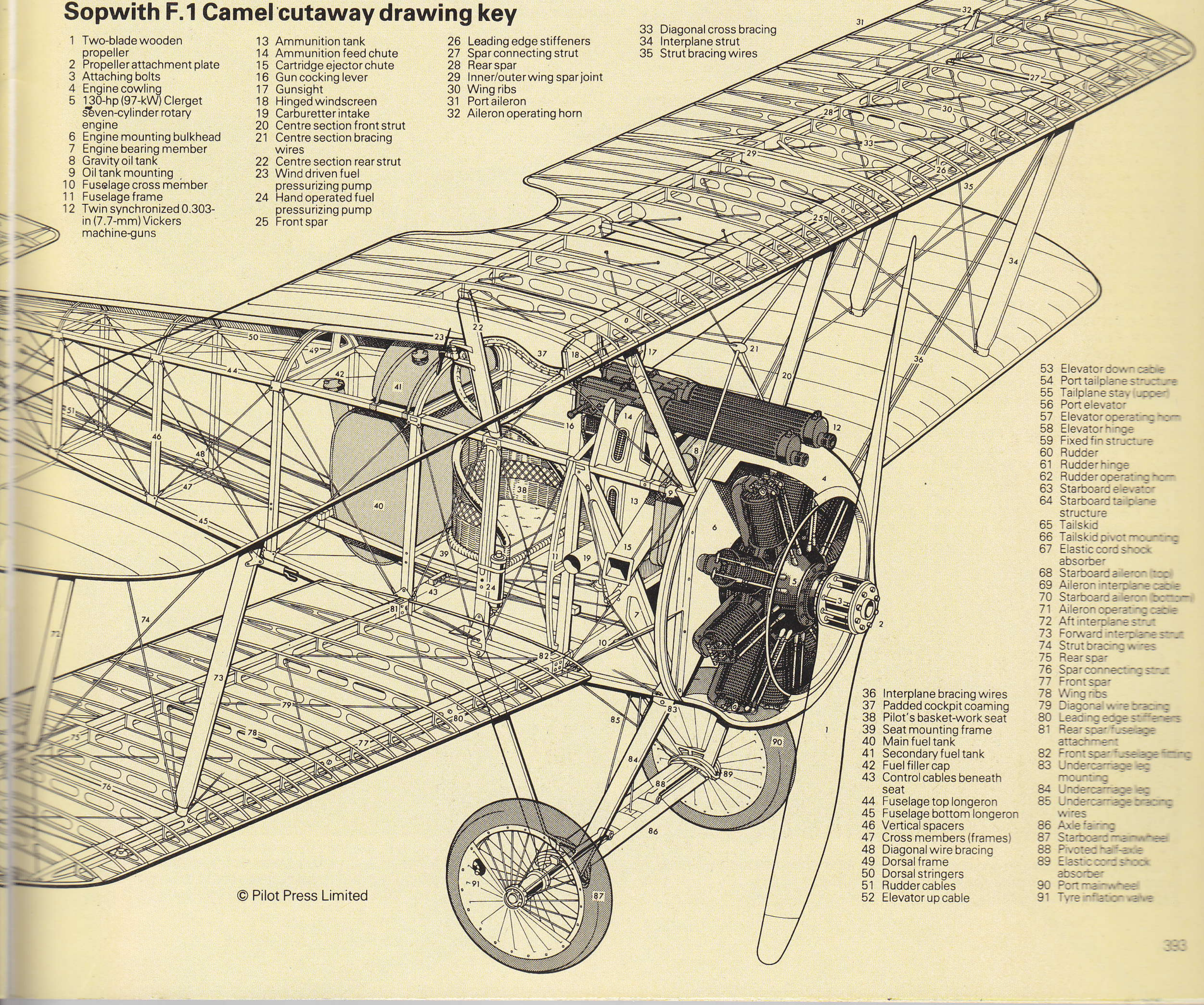
Flown by the Canadian, Captain W. M. Alexander, DSC (17 victories), this Camel of No. 10 (Naval) Sqn displays the horizontal black bars of 'A' Flight when based at Treizennes, shortly before the squadron was renumbered No. 210 when the amalgamation of the RFC and RNAS formed the RAF.

German aircraft which rose to intercept. Three nights later the Camels got amongst German bombers returning to their base and shot two down, and on 17/18 September No. 151 Squadron downed three more.

The last German airship to be brought down during the war was *L53*, shot down by a Camel operated and flown by Lt S.D. Culley RN in a novel manner. For some months trials had been carried out at sea involving a destroyer towing a lighter with a Camel on board. When on 10 August 1918 Admiral Tyrwhitt's Harwich Force set sail for the Heligoland Bight, Culley was in a Camel aboard a lighter being towed by HMS *Redoubt*. The following morning, when the force was off Terschelling, *L53* (Kapitänleutnant Prölss) appeared on the scene at about 4570 m (15,000 ft). Culley took off from the lighter's deck and half an hour later had reached 5485 m (18,000 ft), by which time the airship had climbed higher. Staggering up further, Culley managed to get to within 90 m (300 ft) of his victim and opened fire. One of his guns jammed after firing only seven rounds, but the other caused the airship to erupt in a great sheet of flame and to break apart. After Culley had put his aircraft down on the sea and was hoisted aboard his lighter, the Camel was found to have just a pint of fuel left in the tank.

The name Camel, incidentally, was never recognized officially, this being the popular though universally accepted soubriquet for the little scout with its characteristic 'hump' over its two deadly Vickers guns placed less than 0.6 m (2 ft) in front of the pilot's face. To those in Whitehall it was unimaginatively but simply the Sopwith F.1.

Sopwith F.1 Camel cutaway drawing key



1 Two-blade wooden propeller
2 Propeller attachment plate
3 Attaching bolts
4 Engine cowling
5 130-hp (97-kW) Clerget seven-cylinder rotary engine
6 Engine mounting bulkhead
7 Engine bearing member
8 Gravity oil tank
9 Oil tank mounting
10 Fuselage cross member
11 Fuselage frame
12 Twin synchronized 0.303-in (7.7-mm) Vickers machine-guns
13 Ammunition tank
14 Ammunition feed chute
15 Cartridge ejector chute
16 Gun cocking lever
17 Gunsight
18 Hinged windscreen
19 Carburetter intake
20 Centre section front strut
21 Centre section bracing wires
22 Centre section rear strut
23 Wind driven fuel pressurizing pump
24 Hand operated fuel pressurizing pump
25 Front spar
26 Leading edge stiffeners
27 Spar connecting strut
28 Rear spar
29 Inner/outer wing spar joint
30 Wing ribs
31 Port aileron
32 Aileron operating horn
33 Diagonal cross bracing
34 Interplane strut
35 Strut bracing wires
36 Interplane bracing wires
37 Padded cockpit coaming
38 Pilot's basket-work seat
39 Seat mounting frame
40 Main fuel tank
41 Secondary fuel tank
42 Fuel filler cap
43 Control cables beneath seat
44 Fuselage top longeron
45 Fuselage bottom longeron
46 Vertical spacers
47 Cross members (frames)
48 Diagonal wire bracing
49 Dorsal frame
50 Dorsal stringers
51 Rudder cables
52 Elevator up cable
53 Elevator down cable
54 Port tailplane structure
55 Tailplane stay (upper)
56 Port elevator
57 Elevator operating horn
58 Elevator hinge
59 Fixed fin structure
60 Rudder
61 Rudder hinge
62 Rudder operating horn
63 Starboard elevator
64 Starboard tailplane structure
65 Tailskid
66 Tailskid pivot mounting
67 Elastic cord shock absorber
68 Starboard aileron (top)
69 Aileron interplane cable
70 Starboard aileron (bottom)
71 Aileron operating cable
72 Aft interplane strut
73 Forward interplane strut
74 Strut bracing wires
75 Rear spar
76 Spar connecting strut
77 Front spar
78 Wing ribs
79 Diagonal wire bracing
80 Leading edge stiffeners
81 Rear spar/fuselage attachment
82 Front spar/fuselage fitting
83 Undercarriage leg mounting
84 Undercarriage leg
85 Undercarriage bracing wires
86 Axle fairing
87 Starboard mainwheel
88 Pivoted half-axle
89 Elastic cord shock absorber
90 Port mainwheel
91 Tyre inflation valve

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GERMANY

Albatros D V

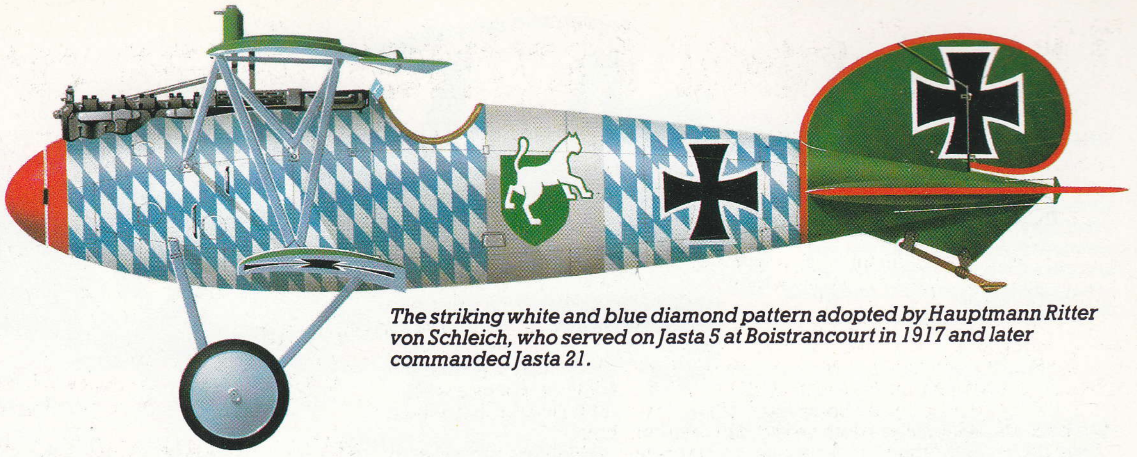
Among the most colourful of all World War I fighting scouts were Robert Thelan's sleek **Albatros D V** aircraft, their pilots' bold insignia reflecting their esprit that had been enhanced during 'Bloody April' of 1917, which had witnessed the near total eclipse of the Allied air forces in France.

Unfortunately, although the D V continued in service right up to the end of the war, it never lived up to the expectations of pilots who had ben anticipating an aircraft with a performance much advanced over that of the slightly less streamlined and lower powered **Albatros D III.** From the outset the aircraft gained a bad reputation on account of a suspected wing fault following a number of failures during prolonged dives, a fault later overcome in the strengthened **D Va.**

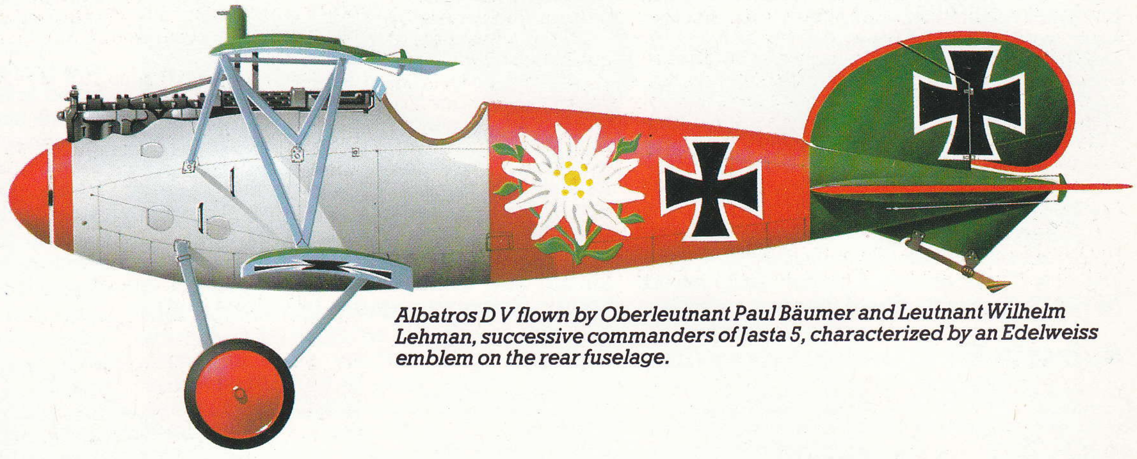
First flown in the early spring of 1917 in prototype form, the D V was ordered into mass production immediately and deliveries started in May, with *Jasta* strengths building up so quickly that by September the number of D Vs at the front had reached 424. Peak strength of 1,117 D Vs and D Vas was reached in May 1918.

To achieve what was probably one of the most perfectly streamlined fuselage shapes of the war, the semi-monocoque structure comprised lightened plywood formers and eight spruce longerons to which was pinned and screwed a series of carefully shaped plywood panels. The cross-section tapered smoothly from the circular nose section to a knife-edge at the stern post, the rear fuselage being of true elliptic section. The Mercedes engine originally installed was completely enveloped in the nose, but the fairings were later removed so that the top of the engine was exposed.

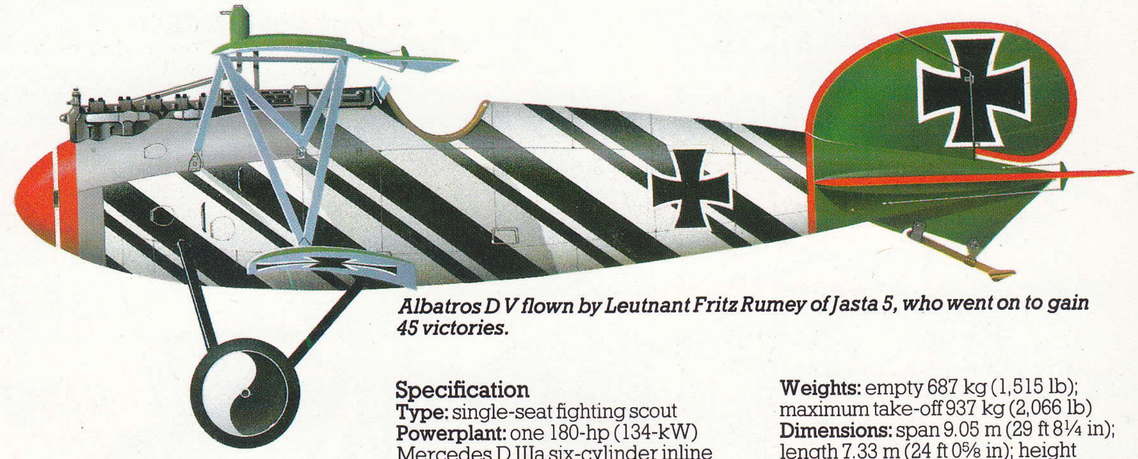
Introduction of the DV was intended to reverse German fortunes which had suffered following the appearance of the S.E.5 and SPAD in 1917, but this hope was not fulfilled, as a result largely of the fast-improving quality of British and French pilots after 'Bloody April'. Nevertheless it is thought that most of the 80 *Jastas* that were deployed to support the great German offensive of March 1918 flew at least some D Vs and D Vas. Among the famous pilots who flew the aircraft were Manfred von Richthofen, Eduard Ritter von Schleich (*Führer* of Jasta 21), von Der Osten (Jasta 4), Bruno Loerzer (Jasta 26), Karl Thom (Jasta 21), Hermann Goering (then a *Leutnant* with Jasta 27) and Hans Joachim von Hippel, whose scarlet dragon-emblazoned D V of Jasta 5 suffered total breakaway of the lower wings in a dive but was nursed down to a crash landing, the pilot surviving to tell the tale.



The striking white and blue diamond pattern adopted by Hauptmann Ritter von Schleich, who served on Jasta 5 at Boistrancourt in 1917 and later commanded Jasta 21.



Albatros D V flown by Oberleutnant Paul Bäumer and Leutnant Wilhelm Lehman, successive commanders of Jasta 5, characterized by an Edelweiss emblem on the rear fuselage.



Albatros D V flown by Leutnant Fritz Rumey of Jasta 5, who went on to gain 45 victories.

Specification

Type: single-seat fighting scout
Powerplant: one 180-hp (134-kW) Mercedes D IIIa six-cylinder inline watercooled piston engine
Performance: maximum speed 165 km/h (103 mph) at 1000 m (3,280 ft); climb to 1000 m (3,280 ft) in 4.0 minutes; service ceiling 5700 m (18,700 ft); endurance 2 hours
Weights: empty 687 kg (1,515 lb); maximum take-off 937 kg (2,066 lb)
Dimensions: span 9.05 m (29 ft 8¼ in); length 7.33 m (24 ft 0⅝ in); height 2.70 m (8 ft 10¼ in); wing area 21.20 m^2 (228.2 sq ft)
Armament: two fixed 7.92-mm (0.31-in) LMG 08/15 machine-guns on the nose, synchronized to fire through propeller disc

An Albatros D Va being inspected by British servicemen after capture. This aircraft was believed to have been later tested by Major James McCudden.

Captured Albatros D V, D 2129/17, previously of Jasta 4, undergoing tests with the British. Aircraft of this type were too late into service to participate in the massacre of Bloody April, 1917.

The Great Fighter Aces of the War

News from the Western Front was of vast casualties and little progress. But now there came a band of heroes, 'knights of the air', whose achievements, though miniscule in the context of the whole war, were applauded around the world.

Pursuing an age-old tradition of fighting prowess, the first great combat aces of the air were necessarily supreme individualists, men who saw themselves as 'knights of the air', whose personal courage transcended wisdom and skill, and whose prowess could be and was spectacularly measured by their tally of enemy aeroplanes struck down in single-handed combat. It was men such as Oswald Boelcke and Lanoe Hawker, however, who quickly recognized that the achievements of individuals would have little bearing on the air war as a whole, and that it would be by personal example and careful coaching that whole squadrons of well-trained pilots would dominate the battle.

Thus it was, after the first generation of pioneering air fighters had fallen in combat, that a new breed of fighter pilots emerged, assisted as they were by more deadly, purpose-designed fighting scouts: men like the greatest pilot of all, Manfred, Freiherr von Richthofen, and Albert Ball, René Fonck, Ernst Udet and many others. Although essentially still individualists (what fighter pilot is not such, even to this day?), these were men who recognized the value of carefully evolved tactics, the use of a formation of aircraft, and of training and experience.

As well as von Richthofen, with his unmatched tally of 80 enemy aircraft destroyed, there was, for example, the superb fighting Frenchman, René Fonck, whose deadly marksmanship frequently enabled him to despatch a foe with no more than half-a-dozen shots placed *comme avec la main* (as if by hand).

These were the men on whom the whole tradition of air combat was founded. Their tactics, evolved in the smoke-filled skies high above the carnage of the Western Front, provided the basis of all air fighting rules for half a century.

THE THREE HIGHEST-SCORING PILOTS OF EACH OF THE WARRING NATIONS

GERMANY

Rittmeister Manfred, Freiherr von Richthofen	80
Oberleutnant Ernst Udet	62
Oberleutnant Erich Loewenhardt	53

FRANCE

Capitaine René Paul Fonck	75
Capitaine Georges Marie Ludovic Jules Guynemer	54
Lieutenant Charles Eugène Jules Marie Nungesser	45

GREAT BRITAIN AND THE BRITISH EMPIRE

Major Edward Mannock, VC, DSO and two Bars, MC and Bar	73
Lieutenant Colonel William Avery Bishop (Canada), VC, CB, DSO and Bar, OBE, DFC, ED	72
Lieutenant Colonel Raymond Collishaw (Canada), CB, DSO and Bar, OBE, DSC, DFC	60

UNITED STATES OF AMERICA

Captain Edward Vernon Rickenbacker, Medal of Honor	26
2/Lieutenant Frank Luke Jr, Medal of Honor	21
Major Gervais Raoul Lufbery	17

ITALY

Maggiore Francesco Baracca	34
Tenente Silvio Scaroni	26
Tenente-Colonello Pier Ruggiero Piccio	24

AUSTRIA-HUNGARY

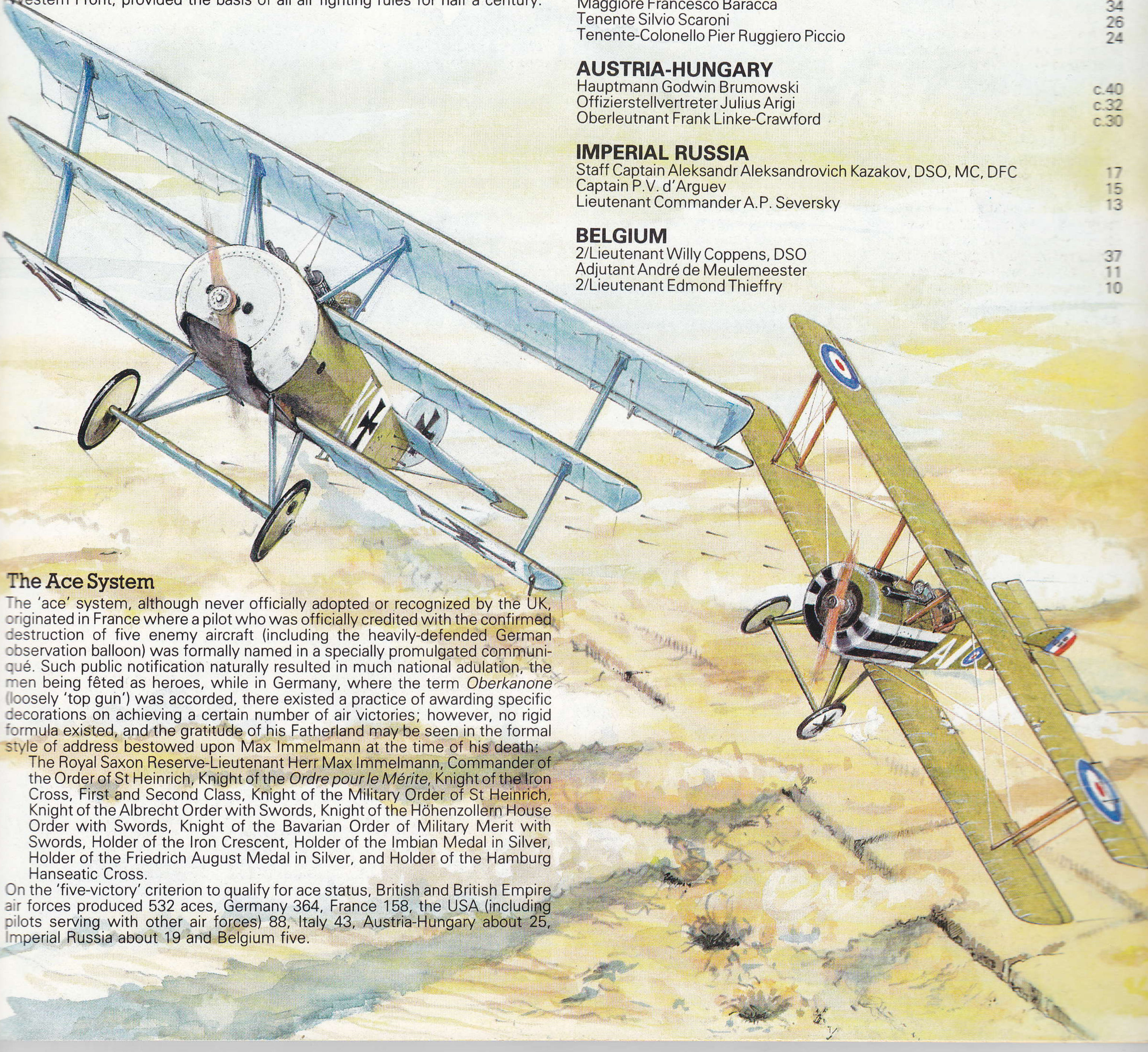
Hauptmann Godwin Brumowski	c.40
Offizierstellvertreter Julius Arigi	c.32
Oberleutnant Frank Linke-Crawford	c.30

IMPERIAL RUSSIA

Staff Captain Aleksandr Aleksandrovich Kazakov, DSO, MC, DFC	17
Captain P.V. d'Arguev	15
Lieutenant Commander A.P. Seversky	13

BELGIUM

2/Lieutenant Willy Coppens, DSO	37
Adjutant André de Meulemeester	11
2/Lieutenant Edmond Thieffry	10



The Ace System

The 'ace' system, although never officially adopted or recognized by the UK, originated in France where a pilot who was officially credited with the confirmed destruction of five enemy aircraft (including the heavily-defended German observation balloon) was formally named in a specially promulgated communiqué. Such public notification naturally resulted in much national adulation, the men being fêted as heroes, while in Germany, where the term *Oberkanone* (loosely 'top gun') was accorded, there existed a practice of awarding specific decorations on achieving a certain number of air victories; however, no rigid formula existed, and the gratitude of his Fatherland may be seen in the formal style of address bestowed upon Max Immelmann at the time of his death:

> The Royal Saxon Reserve-Lieutenant Herr Max Immelmann, Commander of the Order of St Heinrich, Knight of the *Ordre pour le Mérite*, Knight of the Iron Cross, First and Second Class, Knight of the Military Order of St Heinrich, Knight of the Albrecht Order with Swords, Knight of the Höhenzollern House Order with Swords, Knight of the Bavarian Order of Military Merit with Swords, Holder of the Iron Crescent, Holder of the Imbian Medal in Silver, Holder of the Friedrich August Medal in Silver, and Holder of the Hamburg Hanseatic Cross.

On the 'five-victory' criterion to qualify for ace status, British and British Empire air forces produced 532 aces, Germany 364, France 158, the USA (including pilots serving with other air forces) 88, Italy 43, Austria-Hungary about 25, Imperial Russia about 19 and Belgium five.

Fifteen Great Aces

Captain Albert Ball

The first British pilot to be nationally acclaimed on account of his mounting score of air victories, Albert Ball had joined the Sherwood Foresters at the age of 18 in 1914. Transferred to No. 13 Squadron RFC in 1916, Ball flew B.E.2c aircraft on artillery spotting flights before changing to Nieuports with No. 11 Squadron, and by the end of the year had shot down 10 enemy aircraft. He then changed to the S.E.5 (although he always preferred the Nieuport) and before his death on 7 May 1917 had shot down a total of 44 German aircraft. Something of a loner, and an intensely religious young man, he was nevertheless a deadly stalker in the air, pursuing a relentless personal crusade against the enemy. His death in action remains a mystery to this day.

Hauptmann Rudolf Berthold

One of the greatest exponents of the famous Fokker D VII was Rudolf Berthold who, with 44 confirmed victories, was sixth in the roll of German aces. Appointed to command Jagdgeschwader Nr 2 in the last year of the war, Berthold suffered continuous pain from a wound that rendered his right arm useless and prompted him to have his controls altered to allow him to fly at all. At least 16 of his victories were gained during a period when his wound was daily rejecting splinters of suppurating bone. Active in the post-war right-wing *Freikorps*, Berthold was murdered by a band of communist thugs – strangled with the ribbon of his own *Ordre Pour le Mérite*.

Lieutenant-Colonel William Avery Bishop

Originally a subaltern in the Canadian Mounted Rifles, Bishop transferred to the RFC in July 1915, first flying as an observer with No. 21 Squadron. He then trained as a pilot and joined No. 60 Squadron in March 1917, then flying Nieuport 17s. Within two months his score had reached 20 and he already held the DSO and MC. His VC was won for a solo dawn attack on an enemy airfield on 2 June when he destroyed three enemy scouts in the air and shot up others on the ground. He was promoted major, and after a spell off operations took command of No. 85 Squadron in 1918. In one period of 12 days he shot down 25 enemy aircraft, for which he was awarded a second DSO and the DFC. His ultimate score of 72 victories placed him second only to Mannock in the British list of high scoring pilots, and he remained in the Royal Canadian Air Force for many years after the war, eventually dying in Florida in September 1956.

Hauptmann Oswald Boelcke

Universally acknowledged as the first true fighter pilot, Hauptmann Oswald Boelcke is today still commemorated in the honour title of a German air force unit. Born in 1891 he gained his pilot's certificate in August 1914 and served as a reconnaissance pilot (with his brother Wilhelm as observer) during the early months of the war. While serving on Hauptmann Kastner's Feldfliegerabteilung 62 he was fortunate to be selected to fly the new Fokker E I monoplane fighting scout and, after initial instruction by Kastner, set about training promising young pilots in the skills of air combat, invariably by personal trial, error and example, displaying natural gifts of patience and thoroughness. His hand-picked band of pilots, flying the new Albatros D I and D II scouts, became the scourge of the Western Front in 1916-7, and Boelcke himself despatched 40 Allied aircraft. He was killed in combat following collision with a colleague on 28 October 1916 when his aircraft broke up before he could land.

Lieutenant-Colonel Raymond Collishaw

Born in British Columbia in 1893, Collishaw transferred to the Royal Naval Air Service from the merchant service in 1916, first flying Sopwith 1½-Strutters; by the end of that year he had destroyed three enemy aircraft and, after a short spell flying Pups with No. 3 (Naval) Squadron, was appointed 'B' Flight commander on No. 10 (Naval) Squadron, flying Sopwith Triplanes. Under his leadership 'Black Flight' of 'Naval Ten' became one of the most successful of all Allied units in France, all its pilots being Canadians. Although his own score reached 40 by the end of 1917, it was for his brilliant and daring leadership that he was most respected. He subsequently took his victory tally to 60 while commanding Nos 3 and 13 (Naval) Squadrons in 1918. After the war he rose to become an Air Marshal in the RAF and pursued a distinguished career during World War II.

Capitaine René Fonck

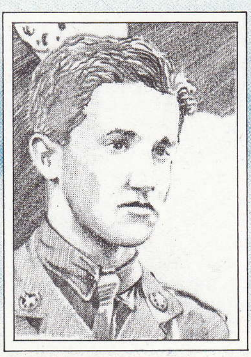
René Fonck, whose official victory score was 75 (but whose personal estimate was 127) was unquestionably one of the greatest of all Allied fighter aces of all time. Aged 20 at the outbreak of war, Fonck transferred from the French army to the air service in 1915 and eventually in 1917 joined Escadrille SPA 103, one of the units of the famous Groupe de Combat 12 *'Les Cicognes'*, flying SPADs. His personal score mounted slowly, and he soon acquired a reputation as a thoughtful and analytical fighter, twice destroying six enemy aircraft on single days, and on one occasion three of his victims being found to have crashed within a radius of 400 m (440 yards). He was a master of deflection shooting, his sparing of ammunition bordering on the uncanny. His many decorations included two British Military Crosses and the French *Croix de Guerre* with 28 palms. He died peacefully at his Paris home in June 1953.

Capitaine George Marie Ludovic Jules Guynemer

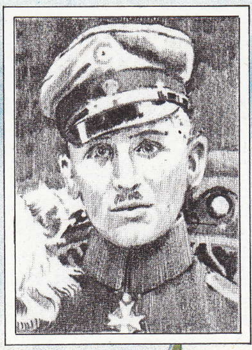
Born in 1894, Georges Guynemer won an unrivalled place in the hearts of the French public for, as a frail and delicate youth, he had twice been rejected for military service when he enlisted as a pupil-mechanic and was posted to Pau airfield in November 1914. He graduated to flying training, and in June 1915 started flying Morane-Saulnier monoplanes with Escadrille MS 3, scoring his first victory a month later. During the next two years he destroyed a total of 54 German aircraft, the majority while flying Nieuports; it was this prowess, his youth and pale good looks that endeared him to the romantic French people. He was himself shot down seven times, and his health was clearly failing when on 11 September 1917 he failed to return from a flight over Poelcapelle. No claim for his defeat in the air has ever been fully substantiated, nor has any trace of his body or aircraft ever been found.

Reserve-Leutnant Max Immelmann

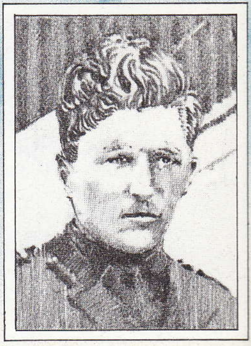
Widely known as the 'Eagle of Lille', Max Immelmann rose from obscure middle class to lauded officer aristocracy in one short year in step with his advancing fame as a fighter pilot of the revolutionary Fokker E I. He was serving with Feldfliegerabteilung 62 at Douai under Hauptmann Kastner and Oswald Boelcke in 1915 when the first E Is became available. Taught by Boelcke to fly and fight the new aircraft, Immelmann scored a total of 15 victories and was held in awe by friend and foe alike, his nimble fighter permitting the use of a climbing manoeuvre that was for an age to bear his name. With Boelcke and



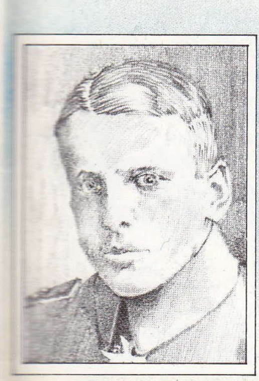
Captain Albert Ball

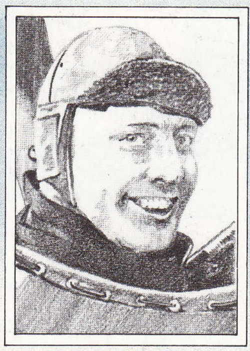


Hauptmann Rudolf Berthold



Lieutenant-Colonel William Avery Bishop


Hauptmann Oswald Boelcke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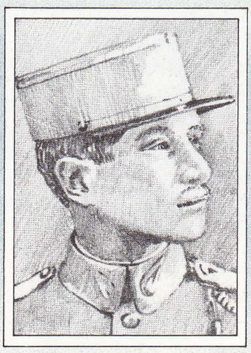
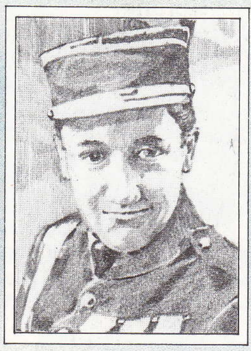
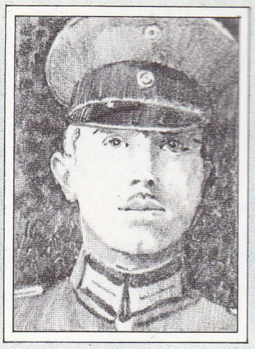
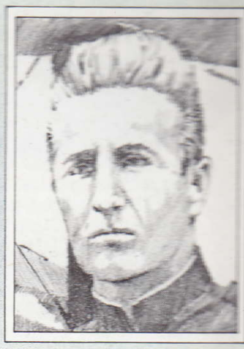
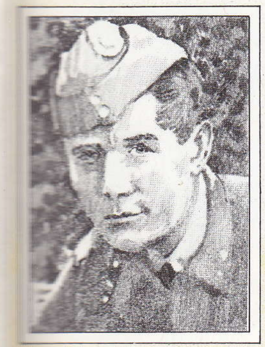
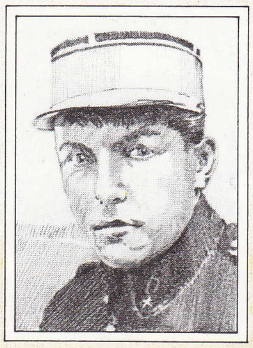

Capitaine René Fonck

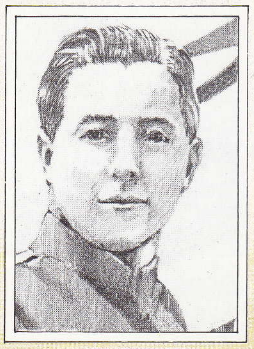

Capitaine George Marie Ludovic Jules Guynemer

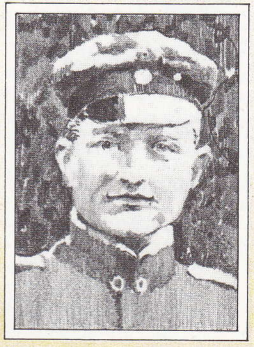

Reserve-Leutnant Max Immelmann

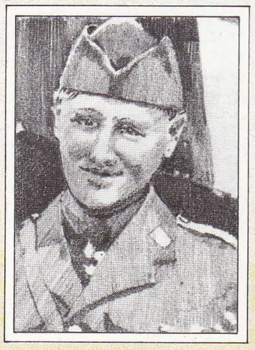

2/Lieutenant Frank Luke Jr

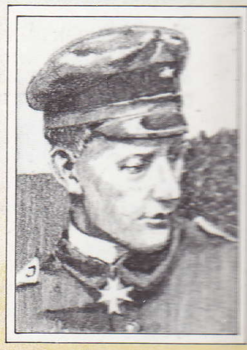

Major Edward Mannock

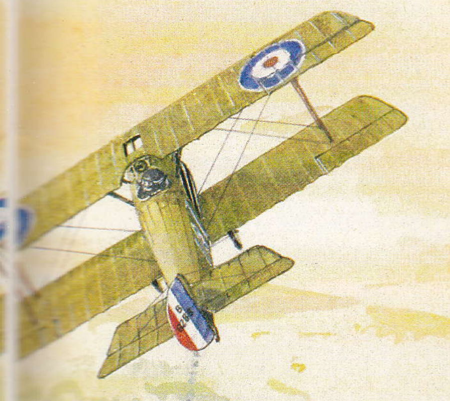

Lieutenant Charles Eugène Jules Marie Nungesser


Major James Thomas Byford McCudden


Rittmeister Manfred, Freiherr von Richthofen


Captain Edward Vernon Rickenbacker


Leutnant Werner Voss



other pilots operating in the Lille area, Immelmann did much to create the famous 'Fokker scourge' in 1915-6, but on 18 June 1916 he was shot down and killed by Lieut G.R. McCubbin of No. 25 Squadron, RFC.

2/Lieutenant Frank Luke Jr

Immortal for his exploits as a 'balloon-buster', Frank Luke achieved his score of 21 victories in the six weeks between 16 August and his death on 28 September 1918. A native of Phoenix, Arizona, where he was born in 1897, he arrived in France with a tough self-confidence and an evident contempt for discipline that did not endear him to his fellow pilots on the 27th Aero Squadron. He was, however, a born pilot if something of a loner, and it was this that attracted him to the German observation balloons, particularly hazardous targets on account of their heavy ground defences. On his last mission he destroyed three balloons before being forced to crashland behind the German lines, preferring to resist capture by fighting enemy troops with a pistol, resulting inevitably in his death. Despite his constant flouting of regulations (an order for arrest was awaiting execution at the time of his death), Luke was awarded a posthumous Medal of Honor.

Major Edward Mannock

Son of a soldier, Mannock only transferred to the RFC from the Royal Engineers in August 1916 despite an eyesight deficiency. He joined No. 40 Squadron in April 1917, then flying Nieuports, and was soon shooting down enemy aircraft. Possessed of a ruthless hatred of the Germans, he showed none of the mercy so often ascribed to airmen of World War I, yet made unending efforts to ensure that his own pilots received the best possible combat training, it being said that no patrol by his pilots was ever taken by surprise. From flight commander with No. 74 Squadron he was posted to command No. 85 Squadron, but on 26 July 1918 his aircraft was hit by rifle fire from the ground and he was killed when his score stood at 73, the highest of any British pilot. His grave was never found and, despite the posthumous award of the Victoria Cross, his career attracted no attention until long after his death.

Lieutenant Charles Eugène Jules Marie Nungesser

The fighting career of the Frenchman Charles Nungesser is one of the legendary sagas of air combat as an extraordinary fight to overcome the effects of wounds suffered in battle. Something of a pre-war playboy with a name as a racing driver in South America and a self-taught pilot, he first fought as a hussar in France during 1914 before transferring to the air service. He suffered frequent wounds in combat, necessitating repeated returns to hospital to have fractured bones rebroken and reset yet, flying Nieuports with Escadrille N65 from November 1915 onwards, he amassed a victory total of 45, often being unable to walk and having to be carried to his aircraft. Nungesser survived the war as a darling of Parisian society, only to disappear during an attempt to fly the Atlantic in May 1927. His aircraft insignia in war and peace comprised a black heart charged with a skull and crossbones, two candles and a coffin.

Major James Thomas Byford McCudden

One of the very small number of peacetime rankers who rose to commissioned service and command in the RFC, McCudden transferred to the flying corps in 1913 and served as an NCO until 1916, during which period he made a number of illicit flights as an observer, but winning the *Croix de Guerre* in the process. He then underwent pilot training, but it was not until August 1916 that he first flew scouts, in the form of D.H.2s with No. 29 Squadron. Receiving his commission on 1 January 1917 he became a flight commander on No. 56 Squadron, flying S.E.5s, and by November his score had reached 20. As a fighter he was instinctively a loner, preferring to stalk his prey so as to attack unseen from close range. He took no leave to return home until April 1918 when, at an investiture, he received his VC, two DSOs and an MC (the highest single collection of awards at a single investiture). He was tragically killed, when his score stood at 57, turning back to his field after an engine failure, an inexplicable error by so brilliant and experienced a pilot.

Rittmeister Manfred, Freiherr von Richthofen

Retaining his cavalry captain's rank during his service with the *Luftstreitkräfte*, the famous German aristocrat pilot Manfred von Richthofen was 32 when war broke out. He transferred from the cavalry in May 1915 but for some months served without distinction with Feldfliegerabteilung 69. In September the following year he was posted to Jasta 2 and received brief but priceless instruction from the great Oswald Boelcke. Thereafter his score of victories mounted steadily and in January 1917 he earned the coveted *Ordre Pour le Mérite*. A cold and calculating fighter, von Richthofen nevertheless pursued the instincts of an aristocratic huntsman, maintaining a collection of silver cups each engraved with the name and particulars of a combat victim. As commander of Jasta 11 it was von Richthofen who shot down Major Lanoe Hawker VC, and later personally led the 'Richthofen Flying Circus', an assembly of experienced young pilots that gained a deadly reputation over the Western Front. It was while flying a Fokker Dr I triplane on 21 April 1918 that he met his death, apparently shot down by Captain A. Roy Brown of No. 209 Squadron, RAF, although controversy has raged ever since as to the exact cause of his death. His score of 80 confirmed victories placed von Richthofen ahead of all other fighter pilots of the war.

Captain Edward Vernon Rickenbacker

Born in Columbus, Ohio, in 1890, and a pre-war racing driver, Eddie Rickenbacker was posted to France in 1917 as General Pershing's army chauffeur, but took flying lessons in his spare time. In March 1918 he secured a posting to fly with the 94th Aero Squadron, then commanded by Raoul Lufbery. He had already destroyed several enemy aircraft when given command of the squadron in September. Between then and the Armistice Rickenbacker destroyed 19 further enemy aeroplanes and balloons to take his score to 26 and his name to the top of the American roll of aces. He was awarded the Medal of Honor and continued in aviation as Chairman of the giant Eastern Air Lines.

Leutnant Werner Voss

A born fighter and natural pilot, Werner Voss, whose 48 victories placed him fourth in the German roll of aces, lacked the leadership qualities of Richthofen and Berthold. He flew Albatros D IIIs with Jasta 5 and Jasta 14 early in 1917, one of his aircraft displaying prominent swastikas on the fuselage. It was through friendship with Richthofen that Voss was posted to command Jasta 10 in July 1917, and for a time ranked second only to his friend. He was ultimately killed on 23 September 1917 while flying a Fokker Dr I triplane in a prolonged fight with seven S.E.5a fighters of No. 56 Squadron, RFC, led by Captain J.T.B. McCudden.

GERMANY

Fokker monoplanes

Anthony Fokker's **Eindecker** (literally 'one wing') monoplanes were the manifestation of his design philosophy combining manoeuvrability with a synchronized machine-gun of acceptable reliability. The original **M 5k** prototype was in effect an approximate copy of the pre-war French Morane-Saulnier Type H monoplane and was first flown in 1914, entering production early in 1915 as the **E I.** In this Fokker incorporated the LMG 08/15 7.92-mm (0.31-in) machine-gun with a mechanical interrupter gear designed by the engineers Luebbe, Heber and Leimberger. Fokker himself flew a number of demonstrations with operational units in May 1915, and by mid-July 11 service pilots of Feldfliegerabteilung (FlAbt) 62 at Douai were flying the E I, among them Leutnant Oswald Boelcke. Another pilot soon to be instructed on the E I was Immelmann.

The E I was something of a makeshift aircraft, rushed into production with an 80-hp (60-kW) Oberursel rotary, and was joined in service by the **E II** which had wings of reduced area in an attempt to increase speed, but this resulted in the aircraft being more dificult to fly and so was less popular. The main version was the **E III**, of which the first example reached the Western Front in August with a 100-hp (75-kW) Oberursel U I, and it was at the controls of this version that pilots such as Boelcke, Immelmann, von Althaus, Buddecke, Parschau and Wintgens were to create the legend of the monoplane's invincibility.

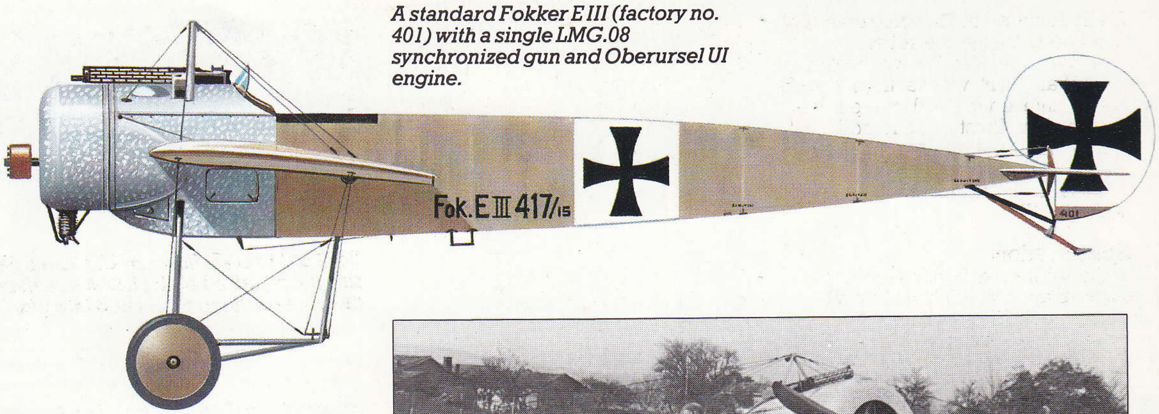
Indeed it was only the fast-growing number of victories being gained by the front-line pilots that reversed an order grounding the Fokker following a number of fatal crashes back in Germany. One further version, the **E IV**, was produced in small numbers, this being powered by a 160-hp Oberursel two-row rotary, and a special example was prepared for Immelmann equipped with three synchronized guns.

It has been suggested that only when a Fokker E III fell intact into British hands on 8 April 1916 could an antidote be developed to counter the 'Fokker scourge'. This is not correct as the Fokker's decline in fact began as early as January that year with the arrival in service of the excellent little Nieuport XI, and with the arrival in service the following month of the RFC's first D.H.2 unit, No. 24 Squadron, under Lanoe Hawker.

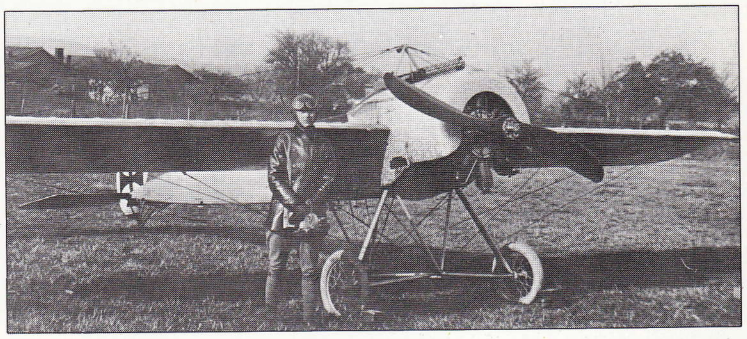
Moreover, contrary to general tradition, the Fokker's gun armament was far from reliable, its ammunition not being wholly suitable for aircraft use, while the gun itself was prone to freezing. Be that as it may, the Eindecker was certainly good enough to hold sway over France for almost a year.

Specification

Type: single-seat fighting scout
Powerplant: one 100-hp (75-kW) Oberursel U I nine-cylinder rotary piston engine
Performance: maximum speed 140 km/h (87.5 mph) at sea level; climb to 3000 m (9,845 ft) in 30 minutes; service ceiling 3500 m (11,485 ft); endurance 1 hour 30 minutes
Weights: empty 400 kg (882 lb); maximum take-off 610 kg (1,345 lb)
Dimensions: span 9.52 m (31 ft 2¾ in); length 7.20 m (23 ft 7½ in); height 2.79 m (9 ft 1¾ in); wing area 16.00 m^2 (172.8 sq ft)
Armament: usually one (sometimes two) forward-firing synchronized LMG 08 7.92-mm (0.31-in) machine-gun



A standard Fokker E III (factory no. 401) with a single LMG.08 synchronized gun and Oberursel UI engine.



Although impossible to identify with certainty, this is probably a Fokker E II, as the majority of later Eindeckers (E III) had covered wheel centres, but the single machine-gun has interrupter gear fitted.

GERMANY

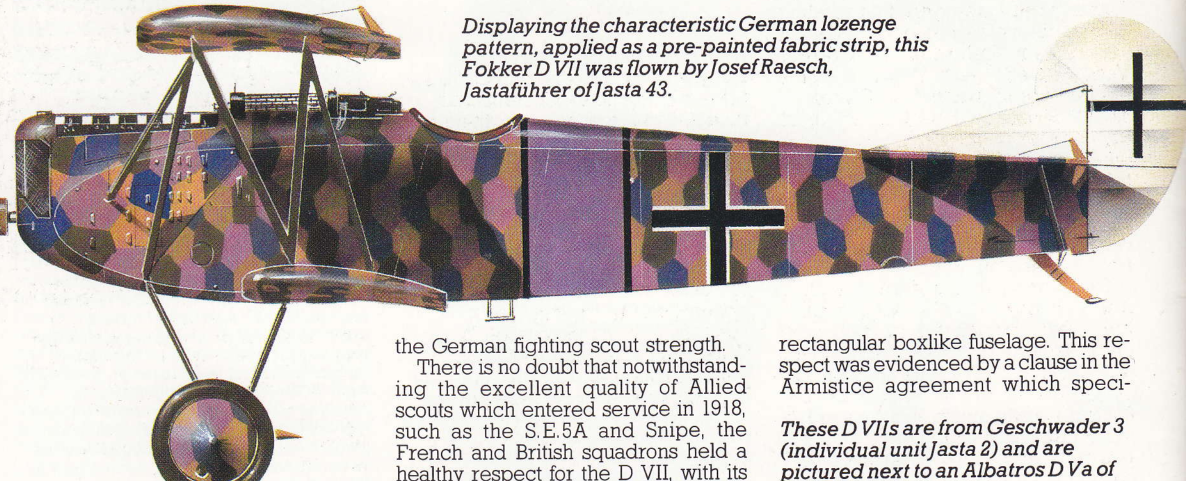
Fokker D VII

Unquestionably the best of all German fighting scout aircraft in World War I, the **Fokker D VII** was designed by Reinhold Platz as a natural improvement on the **D VI**, both of which underwent service evaluation at Johannisthal in January 1918. Although service pilots were unanimous in their verdict in favour of the D VII both types entered service. Ironically Albatros Werke, Fokker's arch rival for production contracts and whose scouts were phased out of production after the Johannisthal trials, was ordered to manufacture the D VII in its own factories.

Early production D VIIs were powered by the 160-hp (119-kW) Mercedes D III water-cooled engine with car-type frontal radiator, but later in 1918 the 185-hp (138-kW) BMW was introduced and bestowed a much improved performance. The success enjoyed by the D VII stemmed not only from its straightforward flying characteristics, which were maintained right up to its ceiling and included a docile stall with no sudden wing drop, but also because of simple construction and ease of repair. The wings were of wooden construction covered with fabric, and the fuselage was a braced steel-tube box girder; the nose was metal-clad forward of the lower wing, and plywood-covered aft of this, stretched fabric being applied on top. The lower wing was fabricated as a single unit, the lower fuselage longerons being interrupted to allow the wing spars to pass right through the fuselage, an arrangement that gave considerable strength. All interplane and centre-section struts were of streamline-section steel tube.

The first *Geschwader* to receive the D VII was Geschwader Nr 1, deliveries being made to its Jasta 4, 6, 10 and 11 late in April 1918, only days after the death of its illustrious commander, Manfred von Richthofen, in a Dr I triplane. JG 1 was followed by Jastas 12, 13, 15 and 19 of Geschwader Nr 2 and Jasta 2, 26, 27 and 36 of Geschwader Nr 3. In due course a total of 46 *Jastas* were flying D VIIs on the Western and Southern Fronts, roughly 65 per cent of the German fighting scout strength.

There is no doubt that notwithstanding the excellent quality of Allied scouts which entered service in 1918, such as the S.E.5A and Snipe, the French and British squadrons held a healthy respect for the D VII, with its austere-looking angular wings and rectangular boxlike fuselage. This respect was evidenced by a clause in the Armistice agreement which speci-



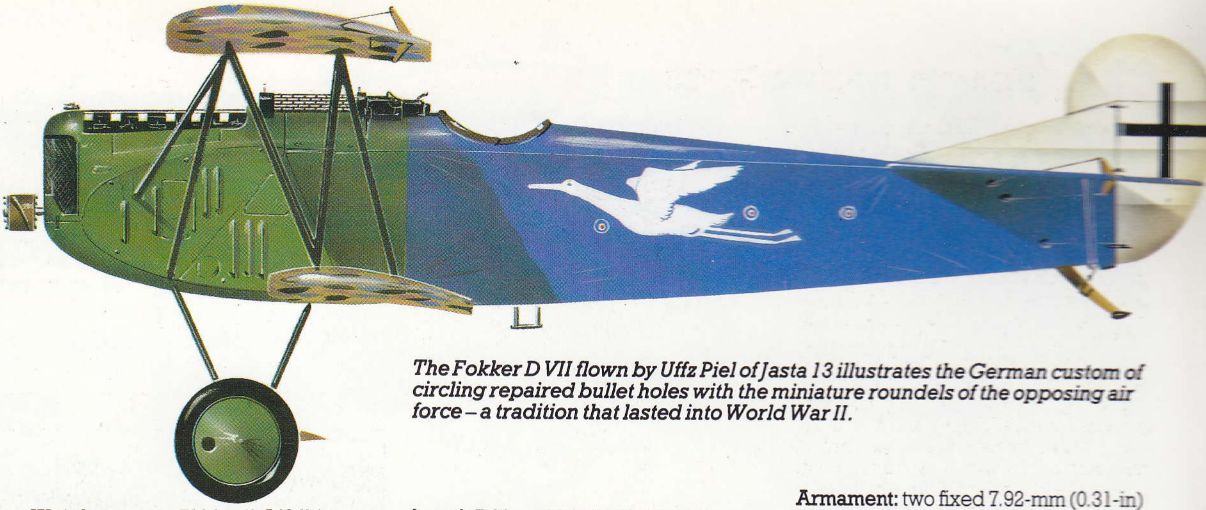
Displaying the characteristic German lozenge pattern, applied as a pre-painted fabric strip, this Fokker D VII was flown by Josef Raesch, Jastaführer of Jasta 43.

These D VIIs are from Geschwader 3 (individual unit Jasta 2) and are pictured next to an Albatros D Va of Jasta 36.

Fokker D VII (continued)

fically required the handing over of all first-line D VIIs to the Allies.

Among the well-known pilots and 'Oberkanonen' whose high scores were achieved in D VII cockpits were men such as Ernst Udet, Rudolf Berthold, von Beaulieu-Marconnay and Georg von Hartelmann, not forgetting Hermann Goering who flew an all-white D VII.



The Fokker D VII flown by Uffz Piel of Jasta 13 illustrates the German custom of circling repaired bullet holes with the miniature roundels of the opposing air force – a tradition that lasted into World War II.

Specification

Type: single-seat fighting scout
Powerplant: one 160-hp (119-kW) Mercedes D III six-cylinder inline water-cooled piston engine
Performance: maximum speed 187 km/h (116 mph) at 1000 m (3,280 ft); climb to 1000 m (3,280 ft) in 3 minutes 48 seconds; service ceiling 7000 m (22,965 ft); endurance about 1.5 hours
Weights: empty 700 kg (1,543 lb); maximum take-off 850 kg (1,874 lb)
Dimensions: span 8.90 m (29 ft 3½ in); length 7.00 m (22 ft 11½ in); height 2.75 m (9 ft 2¼ in); wing area 20.50 m^2 (220.68 sq ft)
Armament: two fixed 7.92-mm (0.31-in) LMG 08/15 machine-guns on nose, synchronized to fire through propeller disc

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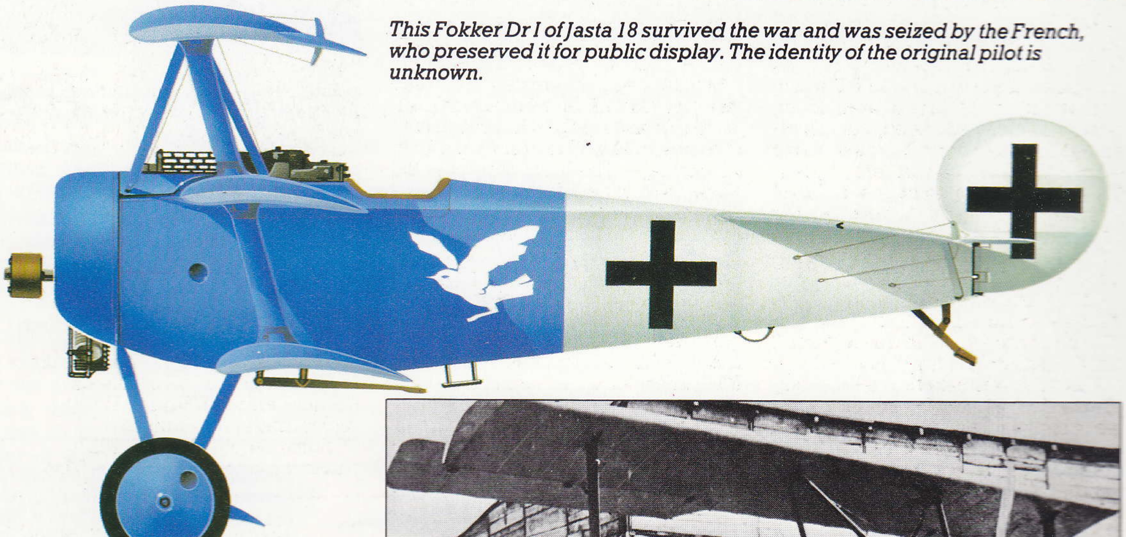
GERMANY

Fokker Dr I

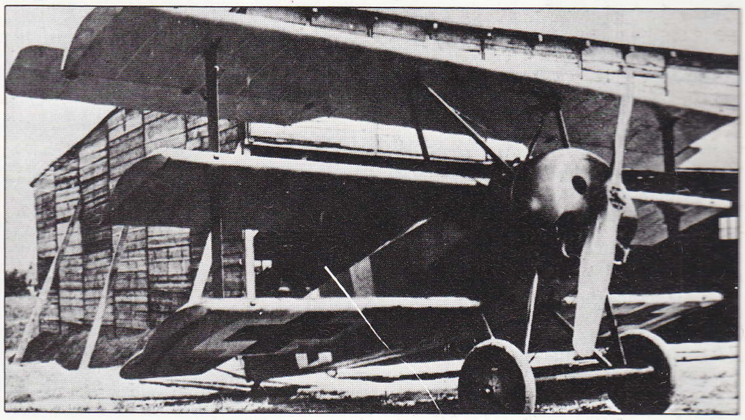


This Fokker Dr I of Jasta 18 survived the war and was seized by the French, who preserved it for public display. The identity of the original pilot is unknown.

Now long discounted as a 'copy' of the Sopwith Triplane (of which at least one early example fell intact into German hands), Reinhold Platz' **Fokker Dr I** (*Dreidecker*, or three wings) triplane obviously owed its conception to reports of the remarkable manoeuvrability of the British scout. However, when originally produced as the **V 3** prototype, the design featured three cantilever wings without interplane struts, but following severe wing vibration during early trials the **V 4** second prototype was fitted with lightweight hollow steel interplane struts to give added stiffness.

The Dr I was ordered into production during the summer of 1917 and the first two aircraft were delivered to Jagdgeschwader Nr 1 at Courtrai on 21 August where they were immediately taken over as the personal mounts of Manfred von Richthofen and Werner Voss (*Führer* of Jasta 1). The former's aircraft was shot down by Camels of No. 10 Squadron, RNAS, on about 14 September while being flown by Oberleutnant Kurt Wolff of Jasta 11; on the other hand Voss in his Dr I shot down 21 enemy aircraft between 30 August and 23 September, when he was killed in an epic fight with S.E.5s of No. 56 Squadron, RFC.

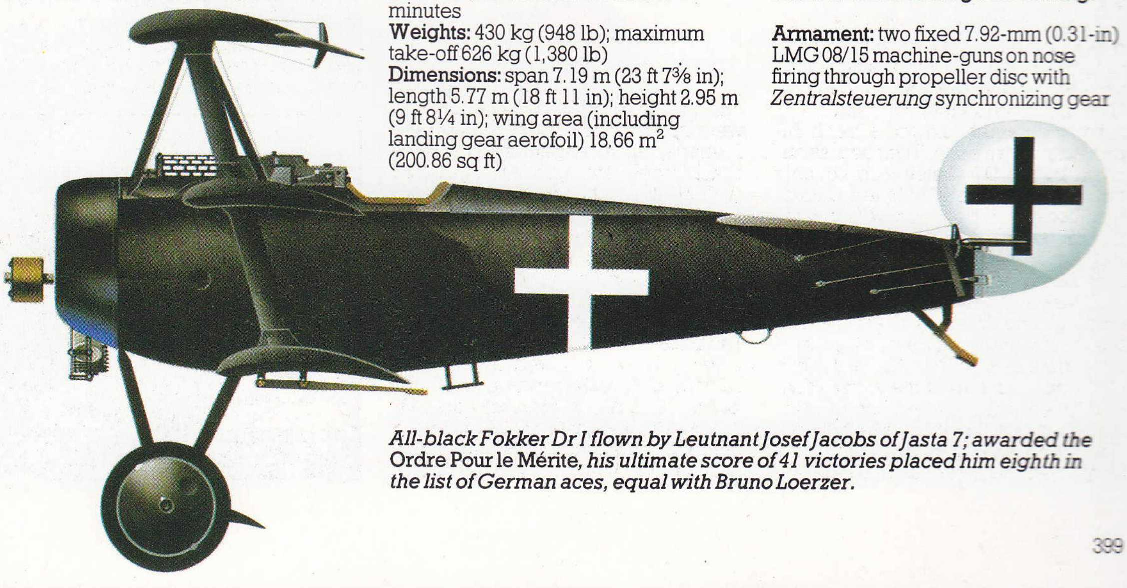
Disaster struck before the Dr I reached widespread service, a number of fatal accidents following break-up of the top wing. Examination of all Jagdgeschwader Nr 1's aircraft disclosed faulty workmanship, assembly faults and rotting of fabric. This led to the aircraft being grounded and replacement of wings with items of sound construction, a step that seriously delayed general delivery of Dr Is to the front. This said, it is quite incorrect to suggest that the reputation of the aircraft rested solely on the exploits of men like Manfred von Richthofen and Werner Voss. It was an exceptionally nimble fighting scout whose performance exactly suited the style of combat being fought over the Western Front late in 1917, and it was flown by many other rising stars of the German air force, including Lothar von Richthofen, Hermann Goering, Ernst Udet and Adolf Ritter von Tutschek. The delay engendered by the wing replacement played havoc with production plans, however, and although flying restrictions were lifted at the end of November 1917 there were probably only about 30 aircraft (instead of the 170-odd planned) available for combat duty. By then the pattern of air fighting was changing perceptibly and new Allied aircraft were beginning to dominate the front. In due course Dr Is equipped at least 15 *Jastas*, including Nrn 4, 5, 6, 10, 11, 12, 15, 17, 26, 27, 32, 36 and Jasta Boelcke.



A standard Fokker Dr I, pictured in 1918; just visible are the ash wing tip skids, omitted from some aircraft, fitted to avoid damage on landing.

Specification

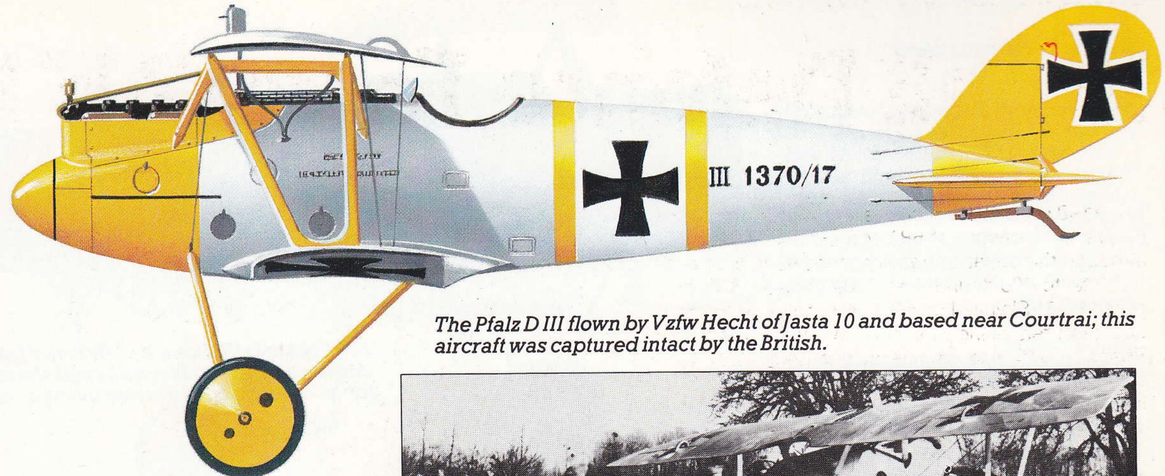
Type: single-seat fighting scout
Powerplant: one 145-hp (108-kW) Oberursel UR II nine-cylinder air-cooled rotary piston engine
Performance: maximum speed 185 km/h (115 mph) at 1000 m (3,280 ft); climb to 3000 m (9,845 ft) in 7 minutes 6 seconds; service ceiling 6100 m (20,015 ft); endurance 1 hour 30 minutes
Weights: 430 kg (948 lb); maximum take-off 626 kg (1,380 lb)
Dimensions: span 7.19 m (23 ft 7⅜ in); length 5.77 m (18 ft 11 in); height 2.95 m (9 ft 8¼ in); wing area (including landing gear aerofoil) 18.66 m^2 (200.86 sq ft)
Armament: two fixed 7.92-mm (0.31-in) LMG 08/15 machine-guns on nose firing through propeller disc with *Zentralsteuerung* synchronizing gear



All-black Fokker Dr I flown by Leutnant Josef Jacobs of Jasta 7; awarded the **Ordre Pour le Mérite, *his ultimate score of 41 victories placed him eighth in the list of German aces, equal with Bruno Loerzer.***

GERMANY

Pfalz D III



The Pfalz D III flown by Vzfw Hecht of Jasta 10 and based near Courtrai; this aircraft was captured intact by the British.

Another Pfalz D III being examined by RFC personnel after capture on the Western Front; the aircraft was later flown in British markings.

The exceptionally attractive **Pfalz D III** owed much to its manufacturer's experience in the licence production of the LFG Roland D II for the Bavarian *Jastas* early in 1917. When the latter contract ran out the company was able to concentrate on its own design, which emerged in the summer of that year, powered by the popular 160-hp (119-kW) Mercedes D III inline engine. Features of the D II (the parallel-chord wing with sharply raked angular tips and oval-section semi-monocoque fuselage) were perpetuated, and the basic structure, comprising spruce longerons and ply formers spirally wrapped in opposite directions by layers of ply strip, imparted considerable strength. The fin was made integral with the rear fuselage and horn-balanced ailerons provided the little aeroplane with crisp lateral control. The top wing, with twin wire-braced box spars, was built as a single unit without dihedral.

The D III passed its official acceptance test in June 1917, but production was slow to get under way because of the skills required, particularly in building the fuselage. Only three D IIIs had reached the front by the end of August, and thereafter the **D IIIa** version, with the guns located on top of the nose (instead of being 'buried') to allow simpler access for maintenance, joined the production line. By the end of the year the front-line strength of D IIIs and D IIIas had reached 276 and 114 respectively, but slowly diminished thereafter. Total production has been estimated at around 1,000 aircraft.

As the Pfalz company was financially supported by the Bavarian government it was natural that the first service allocations should be made to the Bavarian Jastas 16, 23, 32, 34 and 35, which were attached to the Bavarian army in the summer of 1917, followed by Jastas 76, 77, 78, 79 and 80. Subsequently the Pfalz served with Jastas 5, 7, 8, 10, 11, 14, 15, 19, 20, 22, 24, 28, 29, 30, 36, 37, 40, 44, 46, 47, 48, 49, 51, 52, 53, 54, 56, 57, 58, 59, 61, 67 and 69, as well as Marine Feld Jastas I, II and III, although few of these units flew the Pfalz exclusively. The redoubtable Werner Voss was posted to command Jasta 10 at the end of July 1917 and while flying the D III scored four victories before moving on to the Fokker Dr I triplane. Hauptmann Paul Bäumer, who was well known for his habit of bouncing his wheels on a hangar to get his wheels spinning before landing and who served with Jasta 2 (Boelcke), notched up a score of 43 victories, most of which were achieved from the cockpit of the Pfalz D IIIa.

Specification

Type: single-seat fighting scout
Powerplant: one 160-hp (119-kW) or 175-hp (130-kW) Mercedes D III or D IIIa six-cylinder water-cooled inline piston engine
Performance: maximum speed 165 km/h (103 mph) at sea level; climb to 1000 m (3,280 ft) in 3 minutes 15 seconds; service ceiling 5450 m (17,880 ft); endurance 2 hours 30 minutes
Weights: empty 725 kg (1,598 lb); maximum take-off 905 kg (1,995 lb)
Dimensions: span 9.40 m (30 ft 10⅛ in); length 6.95 m (22 ft 9¾ in); height 2.67 m (8 ft 9⅛ in); wing area 22.17 m^2 (238.64 sq ft)
Armament: two fixed 7.92-mm (0.31-in) LMG 08/15 machine-guns on nose, synchronized to fire through propeller disc

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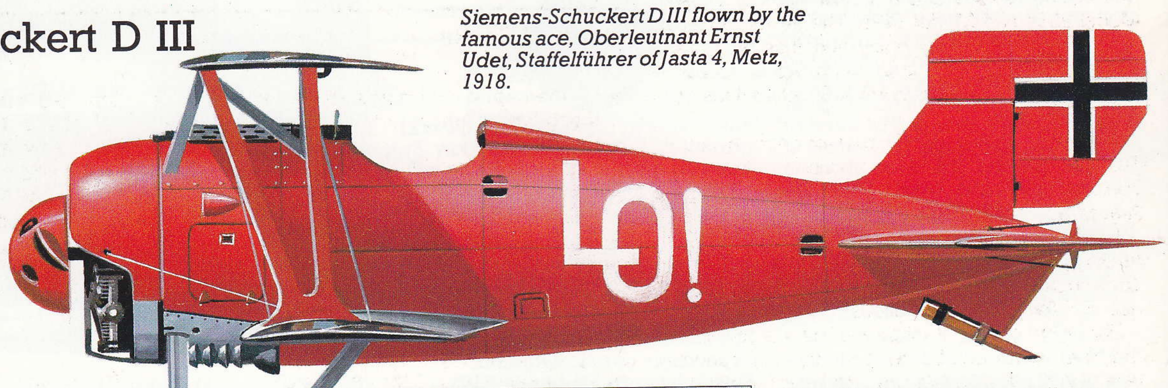
GERMANY

Siemens-Schuckert D III



Siemens-Schuckert D III flown by the famous ace, Oberleutnant Ernst Udet, Staffelführer of Jasta 4, Metz, 1918.

Identifiable by its tapered aileron tips, the Siemens-Schuckert D IV was faster than the D III by some 6 mph (10 km/h) but, apart from a top wing of slightly narrower chord, was generally similar.

Designed by Dipl.Ing. Harald Wolff, the **Siemens-Schuckert D III** was a good but little-known German fighting scout to reach front-line *Jasta* service before the Armistice, although a handful of the much faster Fokker D VIII monoplanes was flown in combat by some privileged pilots in the last days. Ordered into production after the famous Johannisthal competitive trials of January 1918, the SSW D III was powered by a 160-hp (119-kW) Siemens-Halske Sh III (or IIIa) 11-cylinder geared rotary engine driving a four-blade propeller, giving a top speed of 180 km/h (112 mph).

Despite considerable attention paid to the handling qualities, the SSW D III remained a tricky little aeroplane to fly, there being no pre-stall warning, the stall being accompanied by a sudden wing drop and followed by a vicious spin. However, the counter-rotation by crankshaft and cylinders, though doing nothing to reduce engine torque, did counteract the gyroscopic couple so that, unlike other rotary-powered scouts, the D III did not snap more readily into right or left hand turns. Horn-balanced ailerons on all four wings imparted a brisk rate of roll and, in an effort to counter the considerable tendency to swing on take-off (as a result of engine torque), the fin was of marked asymmetric section.

Arrival at the front was accompanied by a spate of engine failures, piston seizure being attributed to the low-quality castor oil being used in Germany in 1918 (compounded by the high engine speed of the hot-running Sh III), and in May all aircraft were withdrawn for installation of the Sh IIIa with improvements and provision for increased cooling. By the time they were ready for return to the Front a new version, the **D IV**, was also being delivered; in this the wing chord was markedly reduced, a change that resulted in some improvement in handling and a 10-km/h (6-mph) increase in speed.

Best known of all Siemens-Schuckert D III (and D IV) pilots was Oberleutnant Ernst Udet, who flew the aircraft as *Staffelführer* of Jasta 4 at Metz in the last months of the war. Although few *Jastas* were equipped exclusively with D IIIs and D IVs, they are known to have flown with Jasta 2, 4, 12, 13, 15, 19, 26, 27 and 36 alongside Fokker D VIIs; the majority was deployed for the defence of the Fatherland with the Kampfeinsitzerstaffeln (Kestas) 2, 4b, 5, 6 and 8 in western Germany, where they are said to have done considerable execution among Allied bombers in the last weeks of the war.

Specification

Type: single-seat fighting scout
Powerplant: one 160-hp (119-kW) Siemens-Halske Sh III (or IIIa) 11-cylinder geared rotary piston engine
Performance: maximum speed 180 km/h (112 mph) at 1000 m (3,280 ft); climb to 3000 m (9,845 ft) in 6.0 minutes; service ceiling 8000 m (26,245 ft); endurance 2 hours
Weights: empty 534 kg (1,177 lb); maximum take-off 725 kg (1,598 lb)
Dimensions: span 8.43 m (27 ft 7¾ in); length 5.70 m (18 ft 8½ in); height 2.80 m (9 ft 2¼ in); wing area 15.12 m^2 (162.76 sq ft)
Armament: two fixed 7.92-mm (0.31-in) LMG 08/15 machine-guns on nose synchronized to fire through propeller disc

Israeli Defence Force/Air Force

Now in the twilight of its operational career with the IDF/AF, the venerable Douglas Dakota has given many years of sterling service as a medium transport aircraft. Note the censorship of unit markings by the Israeli authorities.

By 1987, the IDF/AF will have steadily increased its present strength of 580 combat aircraft to 705, although the onset of obsolescence may decrease the total to 600 during the 1990s. Phase-out of the present 175 Skyhawks will result in only one training squadron remaining in service by 1995, whilst the Phantom will also decline in numbers, with 100 surviving of the 131 in use during 1991. Kfir strength, having peaked at 220 in 1986, will fall to 100 some 10 years later.

When the IDF/AF reaches its planned establishment of 24 combat squadrons at ten bases during the mid-1990s, the Skyhawk and Kfir will have been largely supplanted by Lavis, and the Phantom could be replaced by other imported fighters, which have yet to be ordered.

Of the supporting elements which have contributed to the remarkable success of the Israeli fighter force, particular mention must be made of the airborne intelligence and control aircraft. Most effective of these are four Grumman E-2C Hawkeyes, responsible for tracking enemy aircraft and co-ordinating fighter interception. In addition, four modified Boeing 707s, IAI Aravas and RF-4E Phantoms, plus two Grumman OV-1D Mohawks, four Beech RC-12Ds, remotely-piloted vehicles and even balloons are used to gather strategic and tactical intelligence, all of them ensuring that Israel is aware of what its neighbours are doing.

For the land battle, the IDF/AF attack helicopter force comprises three squadrons with a total of some 35 Bell AH-1 Cobras and a further unit or so with 30 Hughes Model 500MD Defenders, these being backed in the scouting and liaison role by 35 Bell OH-58 Kiowas and a similar number of Bell Model 205s and Model 212s. The ability to move troops and their heavy equipment has proved of immense value in previous wars, and is accomplished by a dozen Aérospatiale Super Frélons and 25 Sikorsky CH-53Ds.

In view of Israel's size, the transport arm, based at Tel Aviv/Ben Gurion, is considerable, including 21 Lockheed Hercules, eight Boeing 707s and several Aravas and Douglas Dakotas. A further two Hercules and some five Boeings are equipped for refuelling fighters. Light transports such as Dornier Do 28s and several types of Cessna fly from Sde Dov, near Tel Aviv, and other bases.

The flying school at Hatzerim starts students on the Piper Super Cub before basic training is undertaken on the Fouga Magister. IAI is rebuilding the Magister fleet with uprated engines and new avionics for service into the 1990s, the improved aircraft (possibly including some acquired from abroad for conversion) being known as the Amit.

Those future pilots now receiving their training in Israel may look ahead with more certainty than many of their contemporaries throughout the world to being involved in air combat during their career. Once assigned to operational squadrons, their task will be to maintain Israel's vital defences, and in doing so, perpetuate the IDF/AF's tradition of excellence in battle.

Current strength in personnel amounts to 28,000, including 2,000 conscripted air-defence personnel; this total rises to 37,000 on mobilization. The IDF/AF headquarters are in Tel Aviv, and apart from flying units, these control 15 air-defence battalions equipped with Improved HAWK surface-to-air missiles.

Order of Battle
Air Force

Eight interceptor squadrons (three with F-16A/B Fighting Falcon, three with Kfir-C2 and two with F-15A/B Eagle)
Six fighter/ground-attack squadrons (five with F-4E Phantom II and one with Kfir-C2)
Five close-support squadrons (four with A-4E/H/N Skyhawk and one with Kfir-C2)
Four helicopter attack squadrons (three with AH-1G/Q/S Cobra and one with Model 500MD Defender)
Three transport squadrons (one with C-130E/H Hercules, one with Arava and one with Dakota)
Two inflight-refuelling flights (one with Boeing KC-707 and one with KC-130H Hercules)
One reconnaissance flight (RF-4E Phantom II)
One early-warning and control flight (E-2C Hawkeye)
One electronic warfare squadron (Boeing 707, OV-1D Mohawk, RC-12D and Arava)
Three helicopter transport squadrons (two with SA 321K Super Frelon and one with CH-53D)
Four light helicopter squadrons (two with Bell Model 205/212 and two with OH-58A Kiowa)
Liaison units (Do 27, Do 28, Cessna Models 172, 180, 185 and 206)
Training units (Super Cub and Magister/Amit)

With distinctive sweptback foreplanes and small nose strakes (incorporated to improve dogfight manoeuvrability), the IAI Kfir-C2s illustrated are optimized for interception duties with Rafael Shafrir 2 AAMs on the outer wing pylons.